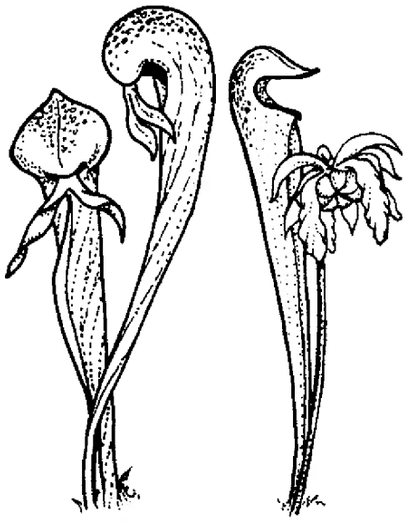
CARNIVOROUS PLANT NEWSLETTER

Journal of the International Carnivorous Plant Society

Volume 51, No. 1 March 2022



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Journal of the International Carnivorous Plant Society
www.carnivorousplants.org

Volume 51, Number 1
March 2022

Front Cover: Allen Lowrie (1948-2021) in the field in Western Australia, getting close up to a *Drosera*. Photo by R. Nunn.

Back Cover: *Drosera lowriei* named in honour of Allen Lowrie. Photo taken near Hyden, Western Australia. Photo by R. Nunn.

Carnivorous Plant Newsletter is dedicated to spreading knowledge and news related to carnivorous plants. Reader contributions are essential for this mission to be successful. Do not hesitate to contact the editors with information about your plants, conservation projects, field trips, or noteworthy events. Advertisers should contact the editors. Views expressed in this publication are those of the authors, not the editorial staff.

All correspondence regarding dues, address changes and missing issues should be sent to the Membership Coordinator at the ICPS. Do not send such correspondence to the editors. Checks for subscriptions should be made to the International Carnivorous Plant Society in US funds. Dues, including a subscription, are $35 per year.

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Carnivorous Plant Newsletter 50th Anniversary Issue

John Brittnacher • john@carnivorousplants.org

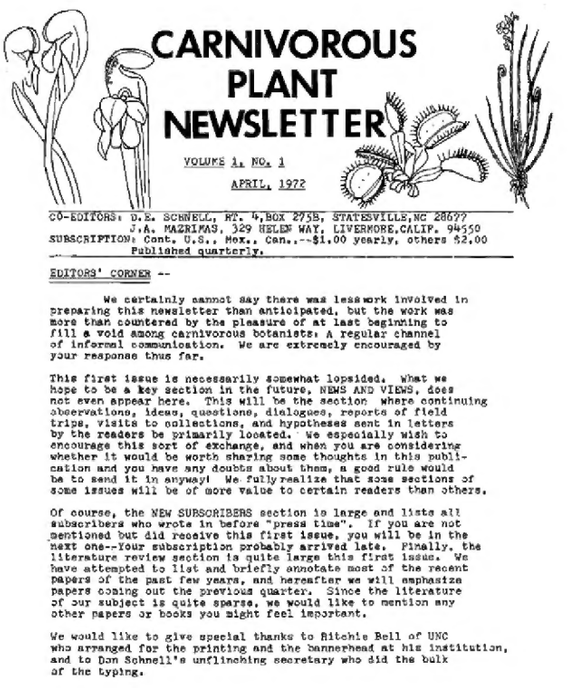
Welcome to 50th Anniversary Issue of Carnivorous Plant Newsletter. Volume 1 number 1 of CPN was published in April 1972. From the start it was intended to be a long-term proposition. It was also international from day one with subscribers from England, Canada, and Australia, as well as the USA. After 47 subscribers from Japan joined for the second issue, about half the subscribers were outside the USA. CPN filled a much-needed role in facilitating the spread of information about carnivorous plants worldwide among English speakers.

CPN was the brainchild of Don Schnell and Joe Mazrimas and it very quickly took on a life of its own. In 1970, Schnell and Mazrimas had a problem. They had separate but overlapping sets of worldwide correspondents with whom they discussed carnivorous plants via letters sent in the mail. Often, they sent out dozens of letters a week. One of their mutual correspondents introduced them to each other, by postal mail of course. They exchanged correspondent lists and a problem became evident quite quickly. There was no way they could individually continue to correspond with that many people. Maybe it would be much easier and better for everyone if they started a newsletter.

Figure 1: Don Schnell (left) and Joe Mazrimas (right) in 1999. This photo was originally published in CPN Volume 40, June 2011, with the names reversed.

The first issue of Carnivorous Plant Newsletter was mailed to a couple dozen subscribers in April 1972. The second issue mailed in July 1972, had almost 100 subscribers. In 1975 the subscribership was capped at 450 for technical reasons. In 1976 it was capped at 650 subscribers. This is the point where the brainchild became too much for the parents to handle. In 1977 for volume 6, Larry Mellichamp and Leo Song joined the team and management of the newsletter was transferred to the California State University, Fullerton, Arboretum, where Leo Song worked.

The content of CPN during this time was somewhat different from what it is today. It was basically a news feed where subscribers submitted postings by letter mail to the editors. A few months later the postings were organized, printed, and mailed to all the subscribers. At this point someone could react to a posting by sending a letter to the editors and that posting would appear in the next issue. It was slow but effective. Postings were organized into announcements, news & views, short notes, feature articles, lists of carnivorous plant vendors and books, want and sales ads, seed bank lists, plant exchange notices, and whatever else was submitted. The issues also included lists of subscribers with names and addresses so subscribers could message each other by postal mail. By the end of 1977, there were 842 subscribers following CPN.



CARNIVOROUS PLANT NEWSLETTER

VOLUME 1, NO. 1

APRIL, 1972

CO-EDITORS: D.E. SCHNELL, RT. 4,BOX 275B, STATESVILLE,NC 28677
J.A. MAZRIMAS, 329 HELEN WAY, LIVERMORE,CALIF. 94550
SUBSCRIPTION: Cont. U.S., Mex., Can..--$1.00 yearly, others $2.00
Published quarterly.

EDITORS' CORNER --

We certainly cannot say there was less work involved in preparing this newsletter than anticipated, but the work was more than countered by the pleasure of at last beginning to fill a void among carnivorous botanists: A regular channel of informal communication. We are extremely encouraged by your response thus far.

This first issue is necessarily somewhat lopsided. What we hope to be a key section in the future, NEWS AND VIEWS, does not even appear here. This will be the section where continuing observations, ideas, questions, dialogues, reports of field trips, visits to collections, and hypotheses sent in letters by the readers be primarily located. We especially wish to encourage this sort of exchange, and when you are considering whether it would be worth sharing some thoughts in this publication and you have any doubts about them, a good rule would be to send it in anyway! We fully realize that some sections of some issues will be of more value to certain readers than others.

Of course, the NEW SUBSCRIBERS section is large and lists all subscribers who wrote in before "press time". If you are not mentioned but did receive this first issue, you will be in the next one--Your subscription probably arrived late. Finally, the literature review section is quite large this first issue. We have attempted to list and briefly annotate most of the recent papers of the past few years, and hereafter we will emphasize papers coming out the previous quarter. Since the literature of our subject is quite sparse, we would like to mention any other papers or books you might feel important.

We would like to give special thanks to Ritchie Bell of UNC who arranged for the printing and the bannerhead at his institution, and to Don Schnell's unflinching secretary who did the bulk of the typing.

Figure 2: Cover page from volume 1 number 1 issue of Carnivorous Plant Newsletter, April 1972.

CARNIVOROUS PLANT NEWSLETTER

VOLUME 1, NO. 4

JANUARY, 1973

CO-EDITORS: D.E. SCHNELL, RT. 4, BOX 275B, STATESVILLE, NC 28677
J.A. MAZRIMAS, 329 HELEN WAY, LIVERMORE, CAL. 94550
SUBSCRIPTION: Cont. U.S., Mex., Can.--$1.00 yearly, others $2.00
Published quarterly with one volume per year.

HELIAMPHORA HETERODOXA

In spite of dire predictions to the contrary, this plant has proven rather easy to grow in several greenhouses in the United States. It has lately been introduced into Australia. The species propagates readily by offsets. Although the plant flowers abundantly, pollen has never matured in cultured plants to our knowledge. This is apparently true of many Heliamphora spp.

Figure 3: First cover page of CPN with a photo, volume 1 number 4, January 1973.

When the CPN editors formed the association with the California State University, they were required to create a legal entity to be the publisher. The name "International Carnivorous Plant Society" was chosen. The name was announced in the March 1980 issue of CPN, and the new society was implemented with the March 1981 issue. The subtitle of CPN became "Journal of the International Carnivorous Plant Society". This name fully expresses the intent of CPN from the day it was conceived. The association with the California State University, Fullerton, lasted until 1998. Thanks to David Gray, in 2001 the ICPS became an educational non-profit corporation in the State of California and registered as a 503(c) public charity with US Internal Revenue Service.

With the advent of e-mail, the internet, and websites in the 1990s, CPN started moving away from chatty newsletter-like content to more curated and edited content. News & Views and other communications from the subscribers migrated to e-mail list servers, then internet forums, and now to Facebook. What there was a continuing need for is a place to publish technical, scientific, and taxonomic articles in addition to the general interest articles and cultivar descriptions. CPN now publishes peer-reviewed scientific and taxonomic articles online from the date of the printed publication. This is in accordance with the latest trend in scientific literature to make all scholarly publications immediately available to everyone.

In the late 1990s, production of CPN became electronic and this allowed for an international team of editors. The original editorial team of over 25 years transitioned to Barry Rice in the USA and Jan Schlauer in Germany. The internationalization of CPN has continued with the optional use of British-English spelling by authors.

Carl Mazur started a project in 2000 to scan all the issues of CPN and make them available as PDFs. David Conner and Bob Ziemer completed the project in 2006 and Bob subsequently created PDFs of individual articles. Parallel to the scanning project, John Brittnacher headed up a project to create an index of all CPN content. Tim Topoleski and Mike Wilder did much of the indexing until Bob Ziemer took it over when he became the managing editor of CPN. These projects culminated in making all issues of CPN available in PDF format to ICPS members on DVD and for download at the ICPS membership website. The public website cpn.carnivorousplants.org was created to provide most of the separate articles published in CPN. Articles can be discovered by searching the index, browsing issue contents, or checking lists of species or cultivar names published in CPN.

This brief history of CPN severely glosses over all the hard work by other editors and volunteers over the years. The ICPS public education website has a detailed history of CPN and the ICPS. The CPN website has the original published articles and notices that can be used to better understand the times and motivations. To find these articles, search keywords for "CPN history" at the CPN website. While you are there, be sure to browse the old issues for some very fascinating articles.

https://cpn.carnivorousplants.org

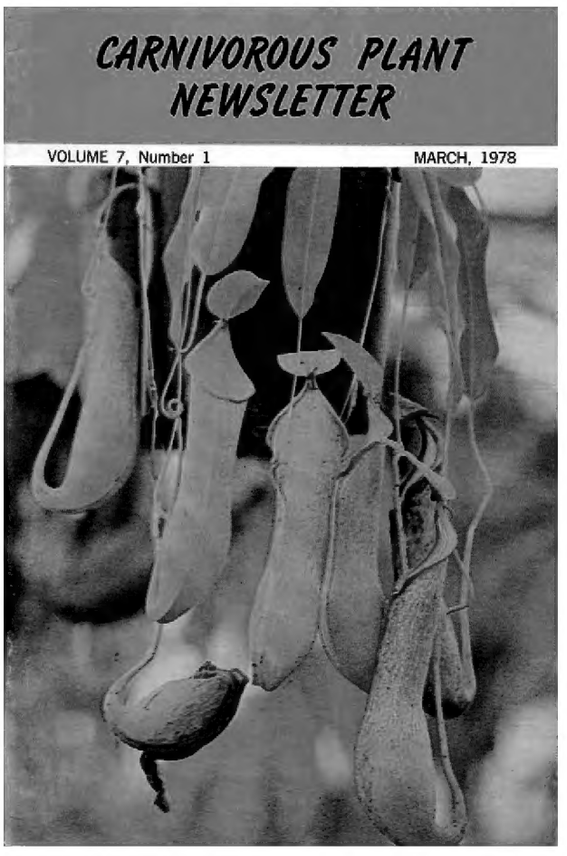


Figure 4: Cover from first CPN in booklet form and with a color photograph, volume 7 number 1, March 1978.

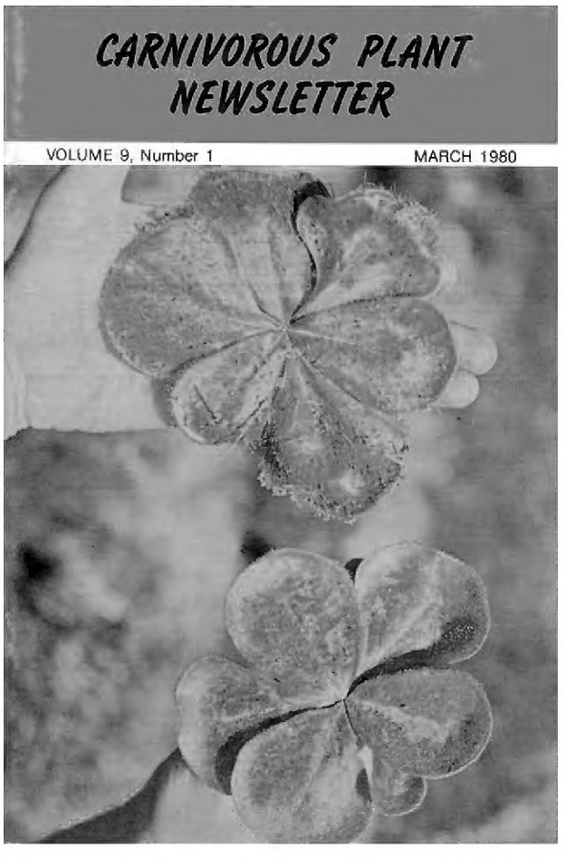
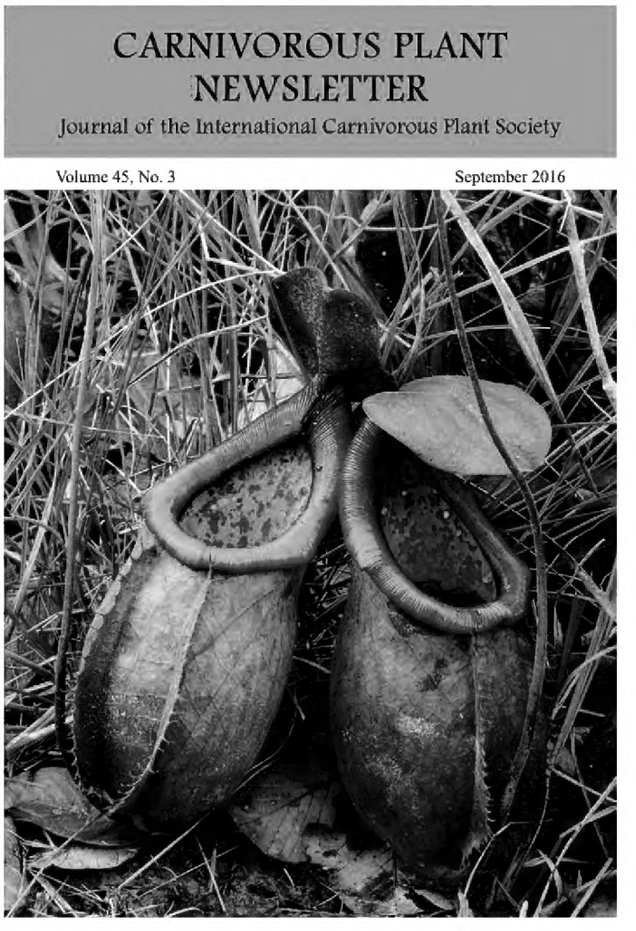


Figure 5: Cover of the issue announcing the International Carnivorous Plant Society, volume 9 number 1, March 1980.



Advances in photography and printing along with more opportunities for travel and research have allowed CPN to bring many interesting, new, and rare species to its pages in brilliant detail.


CARNIVOROUS PLANT
NEWSLETTER
Journal of the International Carnivorous Plant Society
Volume 46, No. 1
March 2017


CARNIVOROUS PLANT
NEWSLETTER
Journal of the International Carnivorous Plant Society
Volume 47, No. 2
June 2018


CARNIVOROUS PLANT
NEWSLETTER
Journal of the International Carnivorous Plant Society
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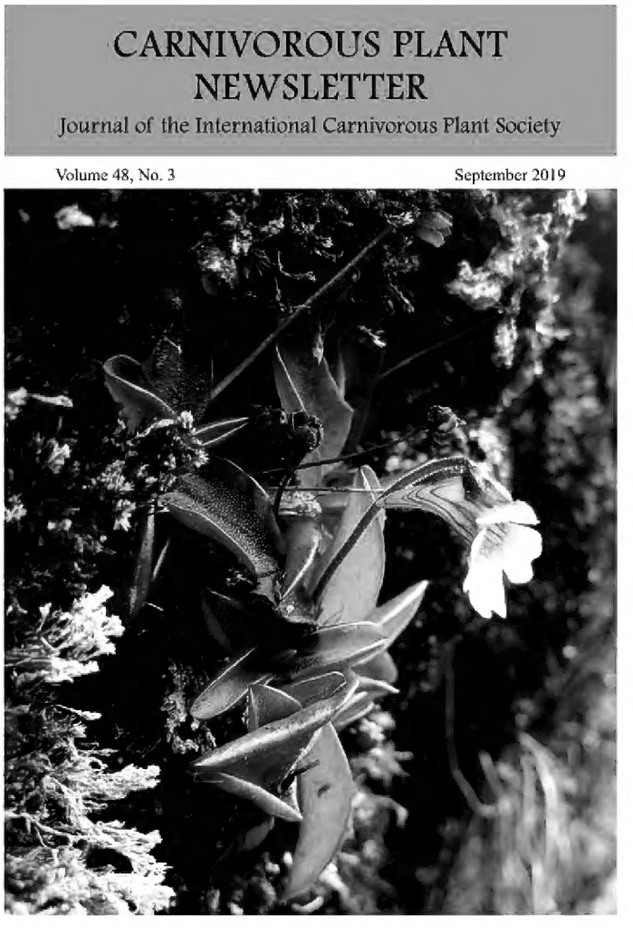
June 2019


CARNIVOROUS PLANT
NEWSLETTER
Journal of the International Carnivorous Plant Society
Volume 48, No. 3
September 2019

Posthumous Lifetime Achievement Award – Allen Lowrie

Richard Nunn • President • ICPS • Sydney • Australia • richardjnunn1@gmail.com

On behalf of the ICPS, I am pleased to announce that the ICPS has determined to award a posthumous Lifetime Achievement Award to Allen Lowrie. The Lifetime Achievement Award is presented in recognition of an individual's outstanding leadership and contribution to the field of Carnivorous Plants. This may be achieved in research, cultivation, conservation, or other ways deemed to be above and beyond the everyday with a significant impact on the field.

The citation for Allen's award demonstrates his outstanding contribution to the field.

> "Allen James Lowrie (1948-2021) is the recipient of an ICPS Lifetime Achievement Award, awarded posthumously in December 2021 for his significant impact on the understanding of the Carnivorous Plants of Australia and his continuous scientific contributions in this field from 1982-2021.
>
> Allen Lowrie dedicated his scientific work to the research of Australian Carnivorous Plant taxonomy, systematics and biology, especially the genera *Drosera*, *Utricularia*, and *Byblis*, which he studied more intensively than anyone else before him and until today. His impact on that field is unreached, spanning 40 years of scientific research.
>
> Allen authored 6 books on Australian Carnivorous Plants and co-authored 3 further works on the *Drosera* of the world and wrote many scientific papers naming the many new species of plants he discovered. During his botanical career Allen named 167 new taxa (species and subspecies) and contributed to the infrageneric classification of *Drose*ra and *Utricularia* in particular. In addition to his work on Carnivorous Plants, Allen was also a world authority on triggerplants, and his contribution to the genus *Styli*dium is significant. His name is honoured in two carnivorous plant species, *Drosera lowriei* and *Utricularia lowriei* and the triggerplant *Stylidium lowrieanum*."

As recipient of this award the Lowrie family have been presented with an original botanical artwork by François Mey commissioned by the ICPS specifically for this occasion.

The Lowrie family with Allen's Lifetime Achievement Award - L-R: Filicity (daughter), Trinity (daughter), Evan (grandson), Pauline (wife), Lochlan (grandson), and Yana (granddaughter).

Botanical artwork of *Drosera lowriei* by François Mey presented to the Lowrie family.

Allen Lowrie at the Northernmost point of Australia, taking some time out on a field trip, an area that he spent much time studying and describing new species of tropical *Drosera* and *Utricularia*. Photo by R. Nunn

Allen James Lowrie (10 October 1948 – 30 August 2021)

Kevin F. Kenneally • School of Agriculture and Environment • University of Western Australia • Perth • Australia • kevin.kenneally@uwa.edu.au

Allen James Lowrie, a member of the International Carnivorous Plant Society, passed away on 30 August 2021, aged 72, after a short illness. He was a world authority on carnivorous plants, styleworts and triggerplants. Born at Mount Hawthorn in Western Australia, he spent his early childhood in Mosman Park before the family moved to Mount Hawthorn. His parents, Winnifred and Alan, were in the fashion industry, which was probably an indication of where Allen's creativity and artistic flair came from. Growing up in Yokine, there were childhood memories of playing barefoot in the bush, making cubby houses and in teenage years riding bikes to hang-out at Lake Monger, where he made a canoe out of corrugated iron.

Beginning work at the age of 15, he forged a successful commercial career, turning his hand to advertising, steel fabrication, working as a geologist's assistant in the Pilbara, and eventually started a business constructing below-ground swimming pools. In 1971, Allen married long-time girlfriend Pauline See and daughters Trinity and Filicity soon followed. Allen always acknowledged the part Pauline played in whatever he did. They were certainly a formidable couple when it came to exploring remote places. Pauline would be seen assisting Allen with his field work activities and helping to press and catalogue his numerous plant collections.

Allen's philosophy on life was largely shaped by a close call with compulsory enrolment for national service (or conscription) into Australia's armed forces during the unfortunate saga of the Vietnam War. From an early age, it drove him to follow his great passion for botany, to be outgoing, to take risks, to profit from his own endeavours and to strive to succeed, but always having fun and adventures along the way. During his commercial career, he invented a range of pool chlorinators and pH controllers. The success of these inventions and his thriving business allowed him to leave the commercial world in 1987 to focus full-time on his studies of Australian carnivorous plants (*Aldrovandra*, *Byblis*, *Cephalotus*, *Drosera*, and *Utricularia*), styleworts (*Levenhookia*), and triggerplants (*Stylidium*).

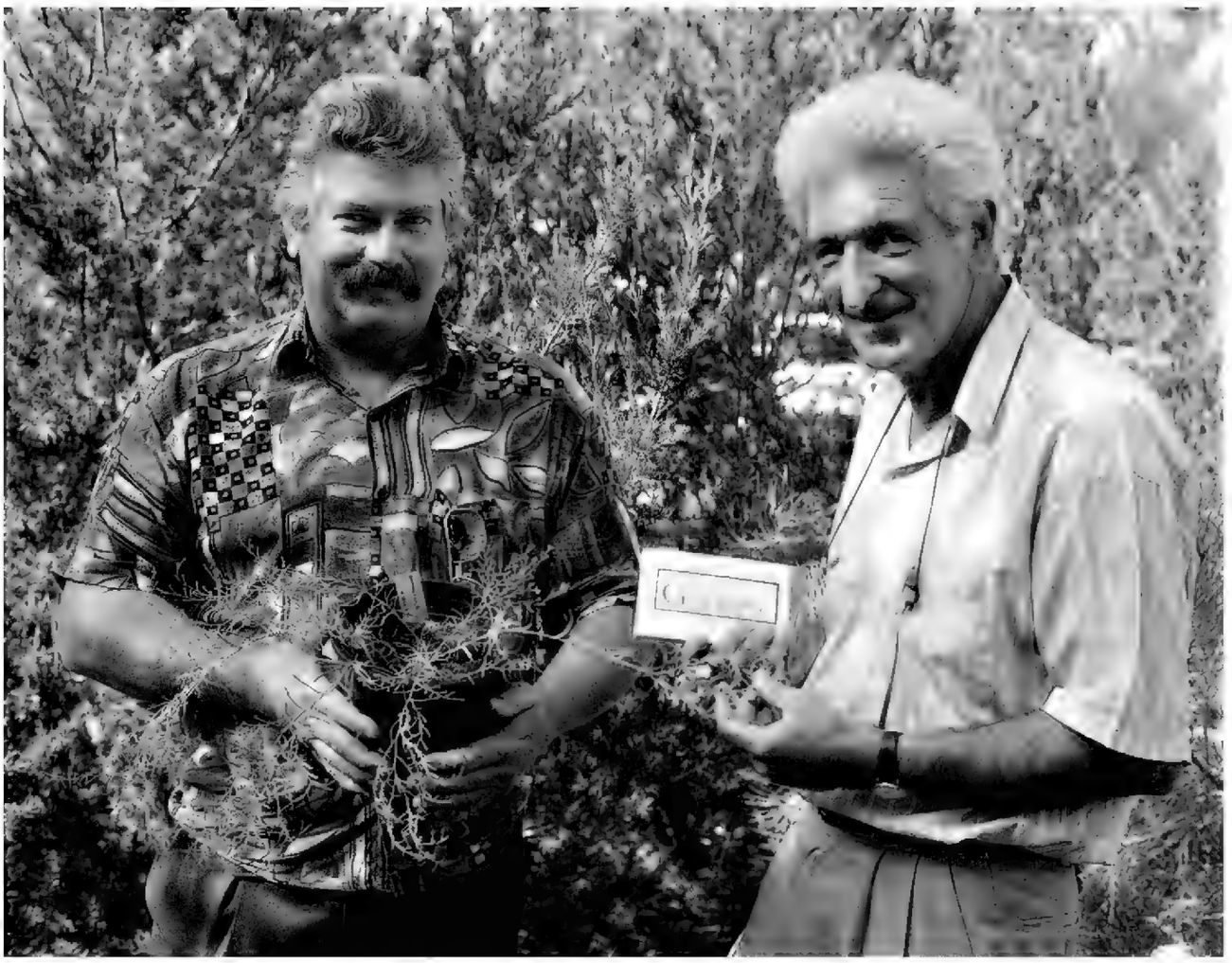
Australia is home to over one third of all carnivorous plants species that are currently known worldwide, and this amazing concentration is far greater than any other continent or country. Australia also boasts two endemic carnivorous plant genera that occur no-where else on earth. This became Allen's challenge; to collect and describe the many new species that awaited discovery. Though not formally trained in botany, Allen persevered in his research studies to become a truly accomplished botanist, working both solo and alongside mentors and colleagues in the plant sciences to make botanical pursuits his life's work. He forged a close relationship with Dr Rica Erickson, described by noted botanist Dr Alex George as "one the foremost amateur natural historians in Western Australia in the 20th Century". Rica enjoyed plant collecting and made very accurate drawings from living specimens. She had published a series of books; 'Orchids of the West' (1951), 'Triggerplants' (1958) and 'Plants of Prey in Australia' (1968). Rica encouraged Allen to continue her studies of carnivorous plants and triggerplants. Like Rica, Allen was an accomplished artist, drawing and photographing plants from living material, providing the many botanical drawings and illustrations for his books and papers. He also built a series of glass and shade houses so that he could study plants and do long-term studies of their growth and flowering. He encouraged other carnivorous plant enthusiasts world-wide to experiment with cultivating Australian species, often with them producing outstanding results.

He also established a successful business, supplying seeds and tubers that he cultivated at his home in Duncraig.

Discovery in a highly synthetic field like systematic/evolutionary botany involves multiple observations, rather than a concerted effort to elucidate a few facts by means of a definitive experiment as in many areas of experimental biology. Allen was a botanist really attuned to observing diversity, so much so, that it became a lifetime obsession. Allen maintained a private working collection of herbarium specimens for comparative taxonomic research. This saved him from having to commute to the Western Australian Herbarium on a regular basis to compare material, although Allen did visit the herbarium and assisted with the curation of the *Drosera* specimens housed there. It was Allen's wish that his specimen collection, known as the 'Herbarium Lowrieanum' be transferred to the Western Australian Herbarium on his death.

Also encouraged by Rica's 'Triggerplants' book was Professor Sherwin Carlquist, an American botanist, plant anatomist and photographer, who visited Western Australia in 1962 and found Rica's 'Triggerplants' book in a Perth bookstore. He described the book as having "the appealing charm that only someone genuinely enthusiastic about a hobby can confer". Carlquist went onto describe many new Australian triggerplant species. In the early 1990s, Allen and Sherwin would collaborate in describing a new species of *Drosera*, as well as a number of species of *Stylidium*. Carlquist described Allen as "an amateur botanist whose enthusiasm was rather like that of Rica Erickson".

Allen was also fortunate to be also mentored by Associate Professor Sidney (Sid) James, a cytogeneticist in the Botany Department at the University of Western Australia. Sid had a passionate



Allen Lowrie (left) with mentor, Associate Professor Sidney (Sid) James.

interest in the evolution of the Australian flora and was keen to encourage his students and individuals, like Allen, in their pursuits in this field. He conveyed to Allen the importance of understanding the variation existing in wild populations as being the key to sound taxonomy and an essential step in developing informed management for conservation. He also emphasised the need for scientific rigour, including the collection of adequate vouchers and documentation of study populations. Sid taught Allen how to do chromosome counts on *Drosera* and *Stylidium*.

Armed with this information, Allen conducted botanical surveys across Australia, including Cape York Peninsula and the Kimberley, some of the most remote places in Australia. He also made expeditions to Borneo and Sumatra, as well as Malaysia, with the assistance of Robert Oliver and Steve Rose to study tropical pitcher plants (*Nepenthes*). Allen wrote that: "We travelled from Padang to Lake Toba, exploring mountains and roadsides along the way. We were fortunate enough to join up with the Nepenthes study husband and wife team from Canada, John Turnbull and Anne Middleton. John had selected some great locations, the highlight of which was Mount Talang, Sumatra, Aia Batumbuak in West Sumatra, Indonesia. It was on this summit where we camped for the night. Just at dusk we heard the sound of a big cat. A tiger was in close proximity. We all slept with one eye open that night".

Remote areas are not always welcoming. They are sometimes dangerous, but the worst part of fieldwork is the uncertainty of not finding what you are searching for. He would take his family on holidays to far flung places, but of course that always involved making plant collections of some description. Oh, and on any trips, he never took food from home, not when you could buy sausages and hot chips from servos and roadhouses!

Between 1987 and 1998, Allen published a three-volume treatise, 'Carnivorous plants of Australia', published by the University of Western Australia, documenting all Australian carnivorous plants known at that time. When the last book of the set was released in 1998, the three volumes had become the most highly respected, most popular and certainly the most valuable of all carnivorous plant publications produced at that time. In 1992, Allen collaborated with Dr Neville Marchant from the Western Australian Herbarium in describing 34 taxa of Western Australian tuberous and pygmy *Drosera* species published in the prestigious Kew Bulletin. During the intervening 25 years since the publication of the original three volumes, Allen continued to undertake intensive field work and make observations, discovering many new Australian carnivorous plants. He carefully revised, updated, and improved his original books and in 2013, his life's work was released in three volumes as 'Carnivorous Plants of Australia Magnum Opus'.

During his botanical career Allen made 1,121 collections that are lodged in the Western Australian Herbarium (PERTH). He named 150 new taxa that are accepted today (*Drosera* 78, *Stylidium* 62, *Byblis* 5, *Utricularia* 4, and *Levenhookia* 1) plus 17 which are considered synonyms now. He made a number of new combinations (*Drosera* 24 and *Stylidium* 3). His name is honoured in two carnivorous plant species *Drosera lowriei*, *Utricularia lowriei*, a triggerplant (*Stylidium lowrieanum*), and a smut fungus growing on *Byblis rorida* (*Yelsemia lowrieana*).

Aside from his many botanical achievements, Allen spent countless hours corresponding with carnivorous plant enthusiasts and scientists across the globe and was always happy to share his vast knowledge, especially eager to assist young beginners. He gave numerous lectures to botany students, wildflower enthusiasts, naturalist club members, and the Kimberley Society, as well as contributing many scientific papers naming the many new species of plant that he has discovered.

In the early 1990s, Allen collaborated with Professor Kevin Kenneally (The University of Western Australia) and Dr David Coates (Western Australian Herbarium) on a series of taxonomic papers

describing new species of *Stylidium*. He also collaborated with Dr John Conran (The University of Adelaide) in describing new species of *Drosera* and *Byblis*.

Allen was a distinctive combination of period blokeyness (often politically incorrect), intellectual substance, a high level of energy, natural combativeness (which could turn into a grudge), and a high-octane instinct for spotting new plant species. He called it as he saw it. There was no holding back. He had a wicked sense of humour that he shared around the campfire and a great belly-laugh. On field trips his snoring was legendary and he was banished to the outer perimeter of the camp site. One night, his snoring was so loud, a female member of the party, who could not sleep due to the noise, walked over to him and shone a head-torch in his face, attempting to wake him up. Allen later re-counted that he awoke to a bright white tunnel of light and a face hovering over him. He was convinced he had died and was entering heaven! When he realised what was happening, he was not at all impressed at being woken!

Beyond his botanical pursuits, Allen was a loving husband, a doting father and grand-father, a keen musician, playing guitar, rhythm, lead and bass, the mandolin, and keyboards. He wrote music for pleasure and composed and recorded no fewer than 30 songs. Prospecting for gold was another hobby that he enjoyed with some success, later becoming a partner with Steve Rose in a number of gold tenements in the Murchison District of Western Australia.

L-R: Denzel Murfet, Stuart Mcilroy, Richard Nunn, and Allen Lowrie pictured with a large plant of *Nepenthes rowaniae*, in August 2008 on Cape York, Queensland, Australia. Photo by Stuart Mcilroy.

In memory of Allen James Lowrie (1948 – 2021)

Richard Nunn • Sydney • NSW • Australia

My first correspondence with Allen Lowrie was in 1983, I was an over enthusiastic teenager who had well and truly been bitten by the CP bug. I wrote Allen a letter and enclosed a stamped self-addressed envelope (we did those type of polite things back then) and eagerly awaited his reply and plant price list. Two weeks later, it arrived and much to my surprise he wrote a few lines and thanked me for my correspondence, years later Allen told me that if someone took the time to write to him, he would always take the time to reply, especially the kids. Thus, began a near 40-year relationship with Allen, one which was initially as a very happy customer and consumer of his knowledge and after finally meeting Allen in Perth in 2002, became a friendship. My early memories of Allen were of someone who was a huge figure in the carnivorous plant community, yet who always had the time for a chat on the phone and was very generous and encouraging with his knowledge.

As the years passed, I was extremely fortunate to spend many days in the field with Allen, initially a few half-day trips around Perth, which over time became more expansive, and we saw a lot of Australia's carnivorous plants together and in the company of Denzel Murfet, Stuart McIlroy, Greg Bourke, John Yates, and Phill Mann. There are very fond memories of 3 trips to Darwin and Kakadu, another adventure to the northern most point of Australia to see the *Nepenthes*, *Drosera*, *Utricularia*, and *Byblis*, 2 ICPS conferences, and some extended field explorations of various parts of his beloved south-west corner of Western Australia. What stays with me was Allen's encyclopedic knowledge of locations, the flora, not just carnivorous plants, and his ability to find elusive plants in difficult sites. Allen was always great fun to travel with, never short of a story and equally enthusiastic about a cold beer at the end of a hard day in the field.

The last 10 years of Allen's life were punctuated by the publication of his epic 'Australian Carnivorous Plants Magnum Opus' and his lead authorship in the collaboration to produce '*Drosera* of the World'. These were challenging projects and Allen's desire to see his work presented the way he wanted it, made for difficult moments as the publisher and commercial considerations often conflicted with Allen's standards and timelines. I was personally closely involved with these projects and often found myself caught in the middle of Allen and the publisher, it's fair to say we had some robust discussions, but I know he was immensely proud of the finished products. I mention this because no account of Allen would be complete without acknowledging his strong personality and his ability to defend his position.

Allen and wife Pauline in the field. Pauline was never far from Allen's side and was a constant companion on many of his fieldtrips.

Allen's contribution was enormous and his body of work on Australia's carnivorous plants unparalleled. I and many others in our community will miss him enormously and I feel privileged to have known Allen James Lowrie.

ROBERT GIBSON • Cardiff Heights • NSW • Australia

In 1987 I bought a copy of 'Carnivorous Plants of Australia: Volume 1.' I was so impressed by it, and the prospect of more volumes to come that I wrote to Allen and offered to help him, if possible, with future volumes. To my surprise he wrote back and was interested in the offer of help. This began a fruitful correspondence that developed into a friendship that had its ups and downs.

Between 1987 and 1993, when I was living in eastern Australia, Allen provided advice on cultivation, photography and sketching carnivorous plants. He also provided copies of his papers. Through frequent letters and phone calls we discussed the ecology, taxonomy, and distribution various plants. Allen described taxonomy as being like a big detective story, and how observations are they key to resolving many mysteries. He stressed the need for good herbarium specimens for taxonomic work and encouraged me to help fill this gap (under an appropriate licence). He also provided me with plants, particularly tuberous *Drosera*, which I treasured. I was able to help him with specimens and information about species in eastern Australia. In the early 1990s he was particularly interested in *Utricularia biloba*, and this gave me a fun project to work on.

I finally met Allen, and his wife Pauline on 20 June 1992 when they transited Sydney airport. It was great to finally meet them. We talked about carnivorous plants for hours; until they were called to board their flight to Perth.

In 1993 I moved to Western Australia for work. This changed the relationship with Allen. After a chance encounter with Allen in the Western Australian Herbarium, in Perth, on 3 September 1996 the friendship was placed on hold for many years.

Allen Lowrie with *Drosera barrettiorum* in the Kimberley, far northern Western Australia.

I met Allen again in September 2008, at the ICPS conference in Sydney. It was good to see Allen again. We had both mellowed, and I had a clearer perspective of his reaction at our previous meeting. Allen had a profound knowledge of carnivorous plants in Australia, thanks to his time in the field and the astute observations made by photographing and sketching plants.

The last time I saw Allen was the ICPS conference in July 2014 in Cairns. He again talked from his wealth of experience. At this conference his Magnum Opus book series on Australian carnivorous plants was launched. It is an impressive publication which provided Allen with a chance to provide more details about carnivorous plants than he had been able to in previous publications.

Allen made a huge contribution to the knowledge of carnivorous plants in Australia. Not only did he describe many species, but he provided insights into different interactions of the plants with each other and a wide range of animals. He presented his work with wonderful illustrations and photos. I am grateful for the advice that he gave me in my early years of researching and writing about carnivorous plants; many aspects of which I use to this day.

Allen has left his mark in the world of carnivorous plants. He set a high standard for presenting information and his work continues to be referenced. Thanks Allen.

MARCEL VAN DEN BROEK • Mijdrecht • Netherlands

I was very sad to hear that Allen has passed away and all the reactions from the carnivorous plant community brought back many memories.

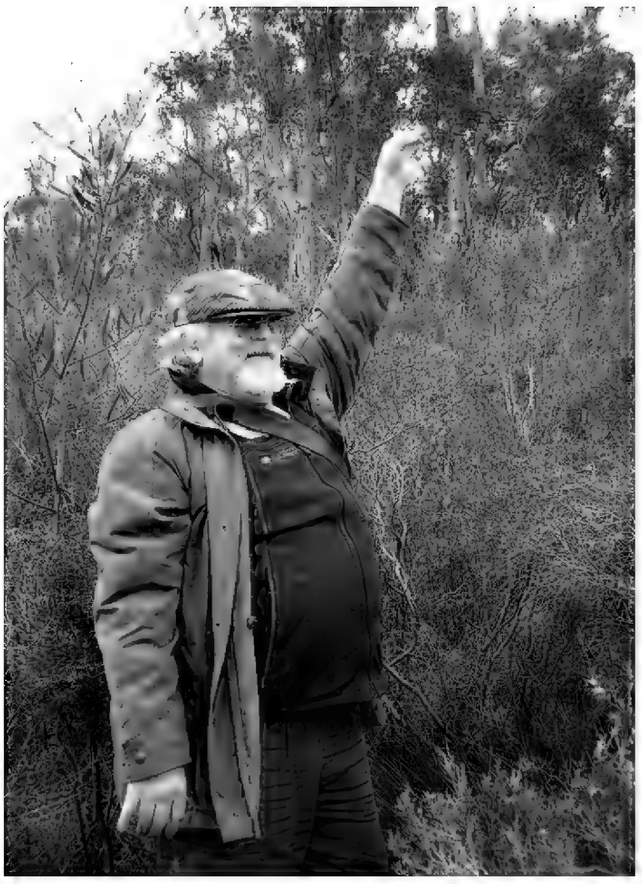
Most people talk about their first book on our beloved plants, but it was the third book that I bought that changed my hobby and to some extent my life, forever. In 1987, I bought Allen's "Carnivorous Plants of Australia", Volume 1 (University of Western Australia Press). This stunning book turned this then young hobbyist forever away from distracting Asian and North American pitcher plants and firmly into Dewy country. It also started a lifelong fascination with the Australian flora (and fauna). I can remember seeing the pictures of plants like *Drosera microphylla* and wanting that plant really bad (still didn't manage to get it, by the way). Two years later, I bought Volume 2 when it came out.

About two years after this book my bookdealer developed a healthy dislike of me, for every time I walked in the store I asked if he heard anything about Volume 3. It took Allen until 1998(!) to produce this final book of what at that time was the most complete work on available on Australian CP's.

It wasn't until 2008 that I actually had the privilege to meet the great man himself. Carnivorous plants had become a bit more than a hobby and after attending a couple of European meetings (EEE) I decided to go to Australia and an ICPS conference. What better place to visit than Sydney? It was here that I was to finally meet Allen. I went with my friend John who also had a bad case of the "Down Under Dews" and this was thoroughly a wonderful trip. We decided to visit Tasmania before the conference and my now good friend Spot Cullen dragged us all over his native island on nothing more than the recommendation of a mutual friend.

Spot was also how I met Allen even before the conference. Spot had an earlier flight to Sydney than we did, so he was waiting for us at the airport. "Put your stuff in your room and come on, we are going to meet some people" he said.

Just over an hour later we stepped out of the car and asked a man with a bunch of paintings for directions. A little later we were sitting at the kitchen table of Richard Nunn, hoisting a beer with Richard, Greg Bourke, and Allen Lowrie! Allen was very friendly and generous with his knowledge and genuinely interested in how our trip went. We showed and discussed some pictures of



Allen Lowrie showing the size of *Drosera erythrogyne*. Photo by Marcel van den Broek.

"something in the *auriculata*-complex" that was unusually short stemmed, that we had found near some military housing area. The size was probably because of the mowed lawn, but Allen was interested and asked about the exact location. Next day the conference would start. (Oh, and the man with the paintings also walked in, it was Phill Mann whom none of us even had seen a picture of before).

After a great conference, Allen and Phill were kind enough to drag a dozen of us all over Western Australia and again they were incredibly generous with their knowledge. We saw over 80 species on multiple locations in a week! All thanks to Allen and Phill looking at their GPS and telling us to "stop and walk 100 meters that way".

It was here that Allen's humor also showed. I remember his dry comment when Phill was taking a picture of *Drosera mannii*: "Well there you have it. *Drosera mannii*, the guy that found it (points at himself) and the thing it was named after (points at Phill)".

The next time I met Allen was in 2010 when he and his grandson Lochlan visited the 2010 ICPS conference in Leiden (two board members, John, and I, had enjoyed the conference so much that Carnivora, the Dutch CPS wanted to host the next conference in the Hortus Botanicus Leiden).

I was honored to introduce the various speakers and Allen was good enough to give two lectures and to join a discussion panel on conservation at this conference. Besides getting him to sign my copies of his books, and a lot of beer, I mostly remember two things about this conference. First, the trouble we had with projecting his pictures as the memory of the university laptop couldn't handle the huge number of full file size pictures he was using. Granted, they presentations were stunning, and the room was packed to capacity (we did use a LARGE room, that was usually used for ceremonies and presentations), but I think each picture was at least 10 megabytes! This also promoted the speech that anyone who has spent some time with Allen would have heard about "the best camera ever made" and him buying extra ones of it online because they didn't make the anymore. In all honesty this is probably the only major point I disagree with him on as the camera was an antique to say the least.

The second thing was his outspoken opinion during the conservation debate that, besides Allen, included people like Madeleine Groves (CITES specialist) and Rob Cantley. Again, Allen was being Allen. As he put it "The only way to protect a species is to make it as common as muck in cultivation". It was the first time I heard that expression, but he got a lot of support from the audience with that statement as you can imagine.

Last time I saw Allen was again during a conference, the 2014 Cairns ICPS conference. Here he was the shining centerpiece of all speakers, presenting his latest work to replace the (still prized) original books with 'Carnivorous Plants of Australia Magnus Opus – Volumes 1-3' (Redfern Natural History Productions).

I will always be grateful for the knowledge he shared and his great company.

Denzel Murfet • Australia

I have known Allen for over 30 years. It was Allen's passion for carnivorous and trigger plants that helped me continue learning about our fascinating flora. I sent over 650 plant collections from across Australia to Allen to help with his research. He always sent back very encouraging letters with the identification of my specimens.

Allen and I accomplished some great field trips together. Several to Darwin and Northwest Australia, mainly near the end of the wet season. We did three trips to Tasmania, two in mid-January and one in the last week of December. I also did numerous trips to Western Australia to help Allen with his research on local species. During December 2009, I helped Allen achieve one of his dreams, of climbing to the top of Bluff Knoll, this took us most of the day. His health was already quite poor by then.

During my times with Allen, I was always in awe of his amazing memory of where to stop for certain species and his great knowledge of the very fine details needed for identification.

Greg Bourke • Berambing • NSW • Australia

Allen wasn't just a world authority on carnivorous plants, writing books and discovering new species, he influenced many young enthusiasts in developing their passion for plants, spending many hours answering questions and inspiring inquisitive minds. Many of the great researchers around the world have shared their stories in recent days, of how their careers in plant sciences were inspired by Allen's passion, and his Australian attitude, to just have a go!

Allen was entertaining to travel with. Despite his obvious wonder of the natural world, he could often be heard verbally abusing that kangaroo or march fly that wouldn't leave him alone, and took

Allen Lowrie pictured with camera and notebook. Allen was meticulous in recording his field observations.

great pleasure in the occasional win, when he slammed his collecting book shut with one trapped in the pages. "Gotcha, you little shit" he'd say.

While he was also well travelled, he was not overly keen on big hikes. If we stopped at a plant site and the plant was on the opposite side of the road, he was not opposed to turning the car around, just to get 5 m closer. This disinterest in hiking did have its upside, however. On a trip crossing the East Alligator River from Arnhem Land, the river was high and flowing. The depth indicator read 0.9 m and the hire car manual stated it was rated to a depth of 0.7 m. Like several others, we waited but it was getting late so as soon as the level reached 0.7 m, "Let's go". Of course, anyone who has crossed a flowing river knows, as soon as you enter, the level on the high side of the car rises! The car began to slide sideways, and the crowd of onlookers gasped as we struggled across, maintaining just enough grip to avoid the drop into the crocodile infested waters below. If we hadn't turned the car around at all those roadside stops, we just wouldn't have had the weight to maintain traction!

His love of roadside food stops on field trips was also something to behold, I have memories of Allen getting into the car with a healthy packed lunch from Pauline, by the first roadhouse the packed lunch was discarded, and he would tuck into a pie, chips, and ice coffee. Fuel for the day of roadside stops, that generally culminated in another roadhouse or Burger King stopover before returning home, to no doubt recount tales of long healthy walks and enjoying his low-calorie packed lunch.

Allen has left his mark on the world of carnivorous plants. His papers and books have been and will continue to be a vital resource for researchers and hobbyists for generations to come and he is certainly missed by the entire community. We'll miss you in the field Al.

ANDREAS FLEISCHMANN • Landsberg • Germany

I remember well a common 4-day field trip with Allen Lowrie to carnivorous plant habitats in the wider Perth area in 2008. Following the 7th ICPS Conference in Sydney, I first spent ten days exploring CP habitats in Western Australia with Thomas Carow and Jan Schlauer – during that time we have seen 72 CP species on a 3120 km long road trip from Perth to Walepole to Hyden to Esperance and back. However, Thomas and Jan had to fly back a few days earlier, so my initial plan was to visit the Western Australian Herbarium in Perth for the remaining days after our common field trip. Yet, when I first told Allen about my plans when I met him earlier at the ICPS Conference in Sydney, he said to me: "No way. If you are in Perth, you will have to come to my place for a visit. I can show you some nice plants in their habitats. You name it, I'll show it to you." Well, I could not reject this kind offer! Allen was a CP friend of mine for about 15 years at the time, and we have been talking about Australian carnivorous plants in lengthy discussions before (by letter, fax, and phone). However, finally seeing these plants AND my Australian CP hero together in their natural habitat in the Southwest of Western Australia for the first time, i.e., being guided to the plants I admired so much by the person who had the most intimate knowledge of their biology and taxonomy – that was the best reason to skip Perth herbarium! So, on the 10th of October, Thomas and Jan dropped me off at Allen's place in Duncraig, where Allen first showed me his herbarium collection, as well as his greenhouse and indoor growing area. We were discussing plant taxonomy half day long. I was quite embarrassed when Allen told me by the end of that day that this was his 60th birthday! I thought that he should be celebrating his great day entirely with his family, but Allen said it was fine the way it was. Nevertheless, I felt deeply sorry for his family on that day (and still do today). On the next four days, Allen took me on a phantastic journey to many of his CP and triggerplant sites: first along Brookton Highway for pygmy and tuberous sundews and then to some *Byblis gigantea* sites. The next day we explored CP habitats

east of Perth from York to Walyunga National Park. On the 13th, Allen took me to sites north of Perth, again to many *Drosera* sites (especially pygmy *Drosera* were encountered that day, unforgettable some fields of *D. citrina* growing in yellow sand!), via Cataby, Badgingarra and Coomallo, as far as Eneabba. Many of the species he showed me were still undescribed in 2008 and would not get named until his Magnum Opus was finally published by end of 2013 (distributed in early 2014). I felt quite honored that he showed me these treasures, and I promised him to keep all info on these plants confidential, which I did. During these four days with Allen, I saw 61 species of carnivorous plants and triggerplants! This was almost as many as I encountered on the ten preceding days exploring a much larger area of the Southwest. Allen also showed me what he considered the most important gear of his car: an electric cooler, filled to the top with bottles of cold beer – in his opinion, this was absolutely essential equipment during a field trip. And I did not mind a cold drink during lunch time in the field as well. I still have not adopted this Australian habit for my student's excursions back home, maybe I should do so one day. Besides that, I learnt a lot from Allen during my short stay with him, perhaps best illustrated when counting the pages filled in my field notebook from 2008: the ten-day field trip with Thomas and Jan covers 29 pages of botanical notes. The four days with Allen fill the last 20 pages of my notebook, densely covered with tightly written notes, including the inside and outside of the book cover, as I was running out of space… I wish I could have made another field trip with Allen later to fill another notebook or two. He certainly would have had enough stories to tell that were worth being written down!

Allen Lowrie made several trips to Southeast Asia to observe *Nepenthes* in the field.

RUSSELL L. BARRETT • Royal Botanic Gardens, Sydney • Australia

In 1991, at the age of 14, I brought a mouldy bag of *Capparis umbonata* from the Kimberley to botanist Kevin Kenneally at the Western Australian herbarium in Perth for identification. After a cursory glance at my 'specimen', Kevin showed me how to press plants properly, and said he would be interested to see more specimens from our cattle station.

After the next holidays home from boarding school, I returned to Kevin with over 280 pressed and dried specimens, including species of *Byblis*, *Drosera*, *Utricularia*, and *Stylidium*, mostly from along the creek that ran past our homestead on Beverley Springs Station, in the north-west Kimberley.

Looking through my collections of *Drosera* and *Stylidium*, Kevin said, "You need to meet Allen Lowrie, he can identify these", and he then arranged a meeting. One of the collections turned out to be an unnamed triggerplant, now *Stylidium adenophorum* Lowrie & Kenneally. A career in botany, and a long-term association with Allen had begun.

Along with my older brother Matt, we started targeting collection of carnivorous plants and triggerplants from our station and surrounding areas. Several of our collections became type specimens of new species named by Allen; *Byblis rorida*, *Drosera caduca*, *D. glabriscapa*, and *Stylidium fimbriatum*. More recently, we co-authored a paper describing four new triggerplants from the Kimberley; *Stylidium latrodectus*, *S. pindanicum*, *S. saintpauliodes*, and *S. willingii*.

Allen was instrumental in our development of taxonomic methodology, piecing together all the different aspects of research required to recognise and name a new species. With over 150 new species described between my brother and I, Allen's early influence has made a much broader contribution to our understanding of the Australian flora.

Allen was always very generous with his time, in explaining his work, and in providing information on species that required more specimens before they could be named. It is with sadness that many new species we worked on together are yet to be named, particularly in Kimberley *Stylidium*, but efforts are underway to complete a number of Allen's unfinished projects.

It is not uncommon for taxonomic problems to take decades of work to resolve, and resolution of the *Drosera indica* complex was one such case. Fieldwork across northern Australia resulted in many additional taxa being proposed, but working out the correct names to apply remained a challenge. Fortunately, during my PhD research on Cyperaceae, I was able to visit key European herbaria and identify critical type specimens for available names in the *D. indica* complex, enabling Allen and I to write a paper typifying names. Importantly, the name *D. indica* was excluded from Australia. This then cleared the way for the description of many new species from this species group in his *Magnum Opus*.

Allen was a friend, colleague, and mentor to myself and many botanists and enthusiasts across Australia and around the world. He will be greatly missed, but his contributions to Australian botany will live on.

Spot Cullen • Hobart • TAS • Australia

Have you ever smelt the flower of *D. lowriei*? It is overwhelmingly sweet, delicate and one of the most beautiful things in the world, a stark contrast to the rough as guts persona of the man himself.

I am however very happy to say that Allen was my friend and his achievements and legacy have been well documented. There is nothing I can possibly add in a scientific sense, but I can speak on an emotional level and what springs to mind when I think about the old bastard… is regret.

We had many a conversation, many a beer and many a laugh, but not a single day in the field. That hurts me more than knowing he's gone. Sadly, I had the same experience with Phill Mann, that other grand old man from Western Australia. Phill's unexpected passing in 2014 ended many a plan we'd concocted to finally hit the road and go find some goodies.

Allen had spent his final years battling a series of health issues and his frustration at not getting out was evident every time I spoke to him. I will admit to even contemplating the thought of renting Allen's old VW kombi as a dubious way of finally sharing the highway with him… but only after a bloody good steam clean inside. Even I have my limits.

I saw him for the last time at his home in August of 2019. His health was finally improving, he was in fine spirits, and we once again discussed a road trip or two. Sadly, it was not to be, and his passing last year came as a great shock.

So, the moral of all this, is to make the most of opportunity. Nothing lasts forever. And Allen, thank you for your guidance and friendship, and whenever I hit the roads of W.A. I'll raise an ice-cold bottle of that weak dishwater you called a beer in your honour. Sleep well my friend.

The huge scientific footprint of Allen James Lowrie (1948 – 2021)

Andreas Fleischmann • Botanische Staatssammlung München • Menzinger Strasse 67 • D-80638 Munich • Germany • fleischmann@bio.lmu.de

Allen Lowrie was a not a university trained botanist. But he was a botanist by passion, which counts even more, because he invested all his massive energy into what he loved. His studies and observations of Australian carnivorous plants and triggerplants for about a half-century will inevitably impact every person with an interest in those plants from the Australian flora. It is not an exaggeration to claim that he was probably the most influential person regarding our recent understanding and knowledge of the carnivorous plant flora of Australia. No other botanist – neither 20th or 21st Century nor before – discovered and described to science more new carnivorous plant species or triggerplants: Allen James Lowrie, with the botanical acronym "Lowrie", named a total of 90 species of carnivorous plants (all of them from Australia) and 66 species of Stylidiaceae (65 *Stylidium* species and 1 *Levenhookia*). Together with the section names published by him, as well as those few of his taxa considered heterotypic synonyms today, Allen validly named 167 plant taxa as new to science.

Allen Lowrie's massive impact on our knowledge of Australian carnivorous plants and triggerplants can be estimated when looking at the number of species published by him (see "Taxa named by Allen Lowrie" below).

Out of the eight species of *Byblis* known today (Lowrie 2014), five were (co)named by Allen Lowrie. He named 75 out of the 166 species (including named natural hybrids) of Australian *Drosera* known as of December 2021, and if we also take into account those species initially (co) discovered and distributed by him but validly named by someone else later (e.g., *D.* × *badgerupii*, *D. mannii*), then Allen Lowrie is responsible for the discovery and naming of nearly half (c. 47%) of all the Australian *Drosera* species diversity! The first plant names he coined were the new combinations *Polypompholyx westonii* (P.Taylor) Lowrie and *Drosera whittakeri* subsp. *praefolia* (Tepper) Lowrie (Lowrie 1989a, b), both not new species discoveries but reflecting his careful morphological and taxonomic examinations of these plants and their closest relatives in their natural habitat. The first carnivorous plant species new to science that was named by him, in 1990, was *D. prostratoscaposa* Lowrie & Carlquist, a species initially discovered and pointed out to him by his good friend, the late Phil Mann (Lowrie & Carlquist 1990). This new carnivorous plant species description was predated by a species of triggerplant in 1989 (*Stylidium edentatum* Lowrie & Carlquist; Carlquist & Lowrie 1989) which has the distinction of being the first plant species he named from the long list of his many own new species discoveries. Allen started discovering and recognizing numerous new carnivorous plant species, especially tuberous *Drosera* and pygmy *Drosera*, since the early 1980s on (see, e.g., Lowrie 1982), for some of which he initially coined scientific names in his benchmark works Carnivorous Plant of Australia Vol. 1 (Lowrie 1987) and Vol. 2 (Lowrie 1989c), however there attributing the new names to "N. Marchant, in preparation". These unpublished names (e.g., "*Drosera leioblasta* N.G.Marchant in Lowrie, nom. nud.", "*Drosera echinoblasta* N.G.Marchant in Lowrie, nom. nud.", etc.) were validated later in a separate taxonomic publication (Marchant & Lowrie 1992), hence the full nomenclatural authority of these species could be interpreted as *Drosera echinoblastus* N.G.Marchant ex N.G.Marchant & Lowrie, etc. However, Allen Lowrie (pers. comms.) explained to me that this was owing to his respect of Neville Marchant as a professional botanist, himself being an untrained botanical novice at the time, but not based on a significant actual contribution of Marchant to the descriptions of the new taxa that would therefore justify nomenclatural ex-authorship.

Most influential was Allen's impact on our knowledge of Australian *Drosera*: From *D.* section *Lasiocephala*, that is the woolly sundews of tropical northern Australia, eight out of the currently known 16 species were discovered and described by Allen, this means his studies revealed half of the known species diversity in this group. In case of *D.* section *Arachnopus*, the *Drosera indica* complex, seven out of the 12 currently accepted species were (co)discovered and described by Allen. It is even more obvious in the sundew groups that occur in SW Western Australia: Out of the 52 known species (and additional six natural hybrids) of pygmy *Drosera* (*D.* section *Bryastrum*), more than half of the species, namely 29, and five of the six known natural hybrids were (co)discovered and (co)described by Allen; in terms of the tuberous *Drosera* (*D.* section *Ergaleium*), it is 25 out of 70 currently recognized species.

The author of this present memorial article agrees with (and discussed/disputed with in good friendship) the late grand-senior of Australian carnivorous plants with all but two of his new *Drosera* species that were treated in his Magnum Opus (Lowrie 2014): these are *Drosera coalara*, which was found to represent transitional populations between *D. citrina* and *D. nivea* (Krueger & Fleischmann 2020), and *Drosera micra*, which is regarded by the present author as part of a variable *D. pygmaea* (see Lowrie *et al*. 2017). *Drosera depauperata* which was previously considered by myself (but also initially by Allen Lowrie himself, pers. coms.) a diminished local form of *D. pulchella* or a hybrid of that species and *D. australis*, has proven to breed true from seed (pers. obs.; A. Lowrie pers. com. 2018) and also was recently revealed as chemotaxonomically well-distinct from *D. pulchella* (Schlauer & Fleischmann 2021). It is hence considered a distinctive taxon here in accordance with Lowrie (2014), correcting my previous erroneous assumption (which was expressed, e.g., in Lowrie *et al*. 2017 and the species list by Fleischmann & Gonella in Fleischmann *et al*. 2018). For the infrageneric classification of Australian *Drosera*, Lowrie (2014) proposed three new sections which are now considered part of *D.* section *Lasiocephala* (in case of sect. *Annuerecta*) and *D.* section *Ergaleium* (sections *Luniferae* and *Macrantha*), following the classification by Fleischmann *et al*. (2018). This revised classification was also shared later by Allen Lowrie (pers. comms.), as for example expressed in his latest treatment of the woolly sundews that included *D. banskii* and *D. subtilis* of his former sect. *Annuerecta* in *D.* section. *Lasiocephala* (Nunn & Lowrie 2021).

Not only did Allen name plants himself, but three Australian plant species were also named in his honor: the triggerplant *Stylidium lowrieanum* in 1989, the tuberous sundew *Drosera lowriei* in 1992, and the annual tropical *Utricularia lowriei* in 2013 (Back Cover, Fig. 1). A smut fungus that is parasitic on *Byblis* also carries Allen Lowrie's name (*Yelsemia lowrieana*; Ustilaginomycetes). This fungus produces galls filled with spores on the stems and leaves of *Byblis*, and it has been named after Allen because it was discovered on a herbarium specimen of *B. rorida* collected by him (Shivas & Vánky 2003).

Allen Lowrie was also a truly prolific writer: he authored six books on Australian carnivorous plants, coauthored two books on *Drosera* of the World, (co)authored 49 publications on carnivorous plants and triggerplants in international peer-reviewed scientific journals, and published 69 articles in non-CI indexed journals (field trip reports, growing hints, species treatments, and popular science articles). This sums up to an impressive total of 126 publications written by Allen Lowrie between 1979 and 2021! (see "Publication List" below).

During his botanical field trips and expeditions, Allen collected herbarium specimens throughout Australia (but with only one collection made in New South Wales), with a notable focus on Western Australia. He also made a few gatherings outside Australia, e.g., in Malaysia and in Borneo (see Lowrie 1983). Altogether his botanical collections comprise 2745 preserved herbarium specimens that were collected or co-collected by Allen Lowrie and deposited in Australian herbaria

Figure 1: Left: *Drosera lowriei*, a rosetted tuberous species from SW Western Australia that was named in honor of Allen Lowrie in 1992. Right: The eponymous *Utricularia lowriei* from tropical Queensland, was named after Allen Lowrie in 2013. Photographs by Richard Nunn.

(AVH 2021), among them 1123 gatherings of *Drosera*, 382 of *Utricularia*, 118 of *Byblis*, 18 of *Nepenthes*, 4 of *Aldrovanda,* 1 of *Cephalotus*, and from the triggerplants 778 of *Stylidium* and 54 of *Levenhookia*, as well as several other non-carnivorous plants (AVH 2021). Yet, his private Herbarium Lowrieanum comprised 4469 collection numbers by 2021, of which several have not been deposited in public herbaria yet (according to Allen's pers. comms. in 2008, his Herbarium Lowrieanum shall be transferred to the Western Australian Herbarium [PERTH] according to his last will). Until his death, he kept his private herbarium collection in his workroom at the basement of his house, where it filled many folders (all specimens neatly mounted on small cardboards, all of them stored separately in sheet protectors that he had bound together in folders, arranged by species – often with the diagnostic floral parts, seeds, and leaf organs well-dissected and separately mounted to the cardboard with sticky tape (see Fig. 2). Allen used this herbarium not only as a comparative taxonomic collection, but also as model for his very skilled botanical

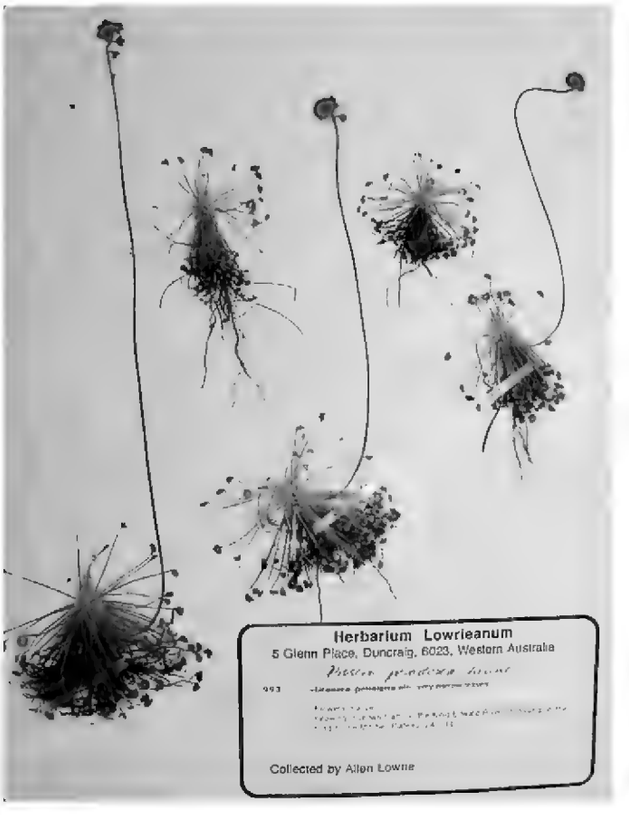


Figure 2: An example from Allen's "Herbarium Lowrieanum": a specimen of *Drosera paradoxa* that had been collected in the Kimberley region of Western Australia by Allen Lowrie in 1994. Photograph by Allen Lowrie.

drawings. I was lucky to study and discuss several specimens in Allen's herbarium together with the proud owner himself in 2008, and I still recollect how well-arranged everything was. Allen kindly shared with me information from his herbarium and his unpublished collection notes on request, and he even detached and mailed to me parts from his *Drosera*, *Byblis*, and *Utricularia* herbarium specimens for my research on several occasions. Many of my taxonomic and phylogenetic studies would not have been possible without the generous aid and material supply from Allen. A short anecdote might illustrate Allen's kind generosity and helpfulness: for my studies of *D.* section *Arachnopus*, I had material available to examine of all known species, except the enigmatic *D. glabriscapa*, a species which was rarely encountered in the wild and even more rarely collected by botanists. Upon my request if he might have available some leaf and seed material for study, Allen wrote: "*Yes, I can take off something for you from the remaining lot of RLB0581 from my Herbarium Lowrieanum*". My immediate reply to him was: "*Allen, thanks for the kind offer, but you cannot send me this, it is too valuable, this is an Isotype!*". His reply was: "*Why shouldn't I send it? It's mine so I can do with it what I want and I have enough to share with you.*" Just 8 days later a parcel arrived in the mail with a friendly letter, as well as 2 individuals from the Herbarium Lowrieanum isotype of *D. glabriscapa* (cut out with the cardboard they were mounted to on his original herbarium sheet) for my studies and as a gift to be deposited in Munich herbarium.

Allen Lowrie's nomenclatural legacy

Eponymy – species named in honor of Allen Lowrie

Carnivorous plants
***Drosera lowriei* N.G.Marchant (1992)**
≡ *Sondera lowriei* (N.G.Marchant) Chrtek & Slavíková (2000)
***Utricularia lowriei* R.W.Jobson (2013)**
Triggerplants
***Stylidium lowrieanum* Carlquist (1989)**
Fungi
***Yelsemia lowrieana* R.G.Shivas & K.Vánky (2003)**

Taxa named by Allen Lowrie (accepted names in bold, synonyms in regular font)

Carnivorous plants
***Byblis aquatica* Lowrie & Conran (1998)**
***Byblis guehoi* Lowrie & Conran (2008)**
***Byblis lamellata* Conran & Lowrie (2002)**
Byblis liniflora subsp. *occidentalis* Conran & Lowrie (1993) = *Byblis filifolia* Planch.
***Byblis pilbarana* Lowrie & Conran (2014)**
***Byblis rorida* Lowrie & Conran (1998)**

Drosera sect. *Annuerecta* Lowrie (2014) = *Drosera* section *Lasiocephala*
Drosera sect. *Luniferae* Lowrie (2014) = *Drosera* sect. *Ergaleium*
Drosera sect. *Macrantha* Lowrie (2014) = *Drosera* sect. *Ergaleium*
***Drosera aberrans* (Lowrie & Carlquist) Lowrie & Conran (2008)**
≡ *Drosera whittakeri* subsp. *aberrans* Lowrie & Carlquist (1992)
***Drosera allantostigma* (N.G.Marchant & Lowrie) Lowrie & Conran (2007)**
≡ *Drosera nitidula* subsp. *allantostigma* N.G.Marchant & Lowrie (1992)
≡ *Drosera nitidula* var. *allantostigma* (N.G.Marchant & Lowrie) Schlauer (1996)
Drosera aphylla Tepper ex Lowrie & Conran (2008), nom. inval., pro syn. = *D. praefolia* Tepper
***Drosera aquatica* Lowrie (2014)**
***Drosera aurantiaca* Lowrie (2014)**
***Drosera australis* (N.G.Marchant & Lowrie) Lowrie & Conran in Lowrie (2014)**
≡ *Drosera occidentalis* subsp. *australis* N.G.Marchant & Lowrie (1992)
***Drosera* × *badgingarra* Lowrie & Conran in Lowrie (2014)**
***Drosera barrettiorum* Lowrie (2014)** [as "barretorum"]
***Drosera basifolia* (N.G.Marchant & Lowrie) Lowrie (2014)**
≡ *Drosera menziesii* subsp. *basifolia* N.G.Marchant & Lowrie (1992)
***Drosera bicolor* Lowrie & Carlquist (1992)**
***Drosera bindoon* Lowrie (2014)**
***Drosera brevicornis* Lowrie (1996)**
***Drosera broomensis* Lowrie (1996)**
***Drosera browniana* Lowrie & N.G.Marchant (1992)**
***Drosera caduca* Lowrie (1996)**
***Drosera callistos* N.G.Marchant & Lowrie (1992)**
***Drosera* × *carbarup* Lowrie & Conran in Lowrie (2014)**
***Drosera citrina* Lowrie & Carlquist (1992)**
***Drosera closterostigma* N.G.Marchant & Lowrie (1992)**
Drosera coalara Lowrie & Conran in Lowrie (2014) = *Drosera citrina* Lowrie & Carlquist
***Drosera collina* (N.G.Marchant & Lowrie) Lowrie (2014)**
≡ *Drosera erythrorhiza* subsp. *collina* N.G.Marchant & Lowrie (1992)
≡ *Sondera collina* (N.G.Marchant & Lowrie) Chrtek & Slavíková (2000)
Drosera coolamon N.G.Marchant in Lowrie (1989), nomen = *D. rechingeri* Strid
***Drosera coomallo* Lowrie & Conran in Lowrie (2014)**
***Drosera cucullata* Lowrie (2014)**
***Drosera darwinensis* Lowrie (1996)**
***Drosera depauperata* Lowrie & Conran in Lowrie (2014)**

Drosera derbyensis **Lowrie (1996)**
Drosera echinoblastus **N.G.Marchant & Lowrie (1992)** [in Lowrie (1989) as "echinoblasta"]
Drosera eneabba **N.G.Marchant & Lowrie (1992)**
Drosera enodes **N.G.Marchant & Lowrie (1992)**
≡ *Drosera dichrosepala* subsp. *enodes* (N.G.Marchant & Lowrie) Schlauer (1996)
Drosera eremaea **(N.G.Marchant & Lowrie) Lowrie & Conran in Lowrie (2014)**
≡ *Drosera macrantha* subsp. *eremaea* N.G.Marchant & Lowrie (1992)
≡ *Drosera stricticaulis* subsp. *eremaea* (N.G.Marchant & Lowrie) Schlauer (1996)
≡ *Sondera eremaea* (N.G.Marchant & Lowrie) Chrtek & Slavíková (2000)
Drosera ericksoniae N.G.Marchant & Lowrie (1992) = *Drosera omissa* Diels [in Lowrie (1989) as "ericksonae"]
Drosera erythrogyne **N.G.Marchant & Lowrie (1992)** [in Lowrie (1989) as "erythrogyna"]
≡ *Sondera erythrogyne* (N.G.Marchant & Lowrie) Chrtek & Slavíková (2000)
Drosera erythrorhiza subsp. *squamosa* (Benth.) N.G.Marchant & Lowrie (1992) ≡ *D. squamosa* Benth.
Drosera esperensis **Lowrie (2014)**
Drosera fragrans **Lowrie (2014)**
Drosera geniculata **(N.G.Marchant & Lowrie) Lowrie (2014)**
≡ *Drosera gigantea* subsp. *geniculata* N.G.Marchant & Lowrie (1992)
≡ *Drosera gigantea* var. *geniculata* (N.G.Marchant & Lowrie) Schlauer (1996)
Drosera glabriscapa **Lowrie (2014)**
Drosera grievei **Lowrie & N.G.Marchant (1992)**
Drosera helodes **N.G.Marchant & Lowrie (1992)**
Drosera hirsuta **Lowrie & Conran in Lowrie (2014)**
Drosera hyperostigma **N.G.Marchant & Lowrie (1992)**
Drosera indumenta **Lowrie & Conran in Lowrie (2014)**
Drosera kenneallyi **Lowrie (1996)**
Drosera lasiantha **Lowrie & Carlquist (1992)**
Drosera **×** ***legrandii*** **Lowrie & Conran in Lowrie (2014)**
Drosera leioblastus **N.G.Marchant & Lowrie (1992)** [in Lowrie (1989) as "leioblasta"]
≡ *Drosera paleacea* subsp. *leioblastus* (N.G.Marchant & Lowrie) Schlauer (1996)
Drosera leucostigma **(N.G.Marchant & Lowrie) Lowrie & Conran (2007)**
≡ *Drosera nitidula* subsp. *leucostigma* N.G.Marchant & Lowrie (1992)
≡ *Drosera nitidula* var. *leucostigma* (N.G.Marchant & Lowrie) Schlauer (1996)
Drosera magna **(N.G.Marchant & Lowrie) Lowrie (2014)**
≡ *Drosera erythrorhiza* subsp. *magna* N.G.Marchant & Lowrie (1992)
≡ *Sondera magna* (N.G.Marchant & Lowrie) Chrtek & Slavíková (2000)

***Drosera major* (Diels) Lowrie (2014)**
≡ *Drosera bulbosa* subsp. *major* (Diels) N.G.Marchant & Lowrie (1992)
Drosera manniana N.G.Marchant in Lowrie (1989), nomen = *Drosera mannii* Cheek
Drosera menziesii subsp. *penicillaris* (Benth.) N.G.Marchant & Lowrie (1992) = *Drosera drummondii* Planch.
Drosera micra Lowrie & Conran in Lowrie (2014) = *Drosera pygmaea* DC.
***Drosera monantha* (Lowrie & Carlquist) Lowrie (2014)**
≡ *Drosera macrophylla* subsp. *monantha* Lowrie & Carlquist (1992)
Drosera monticola (Lowrie & N.G.Marchant) Lowrie (2005) nom inval
***Drosera monticola* (Lowrie & N.G.Marchant) Lowrie (2011)**
≡ *Drosera stolonifera* subsp. *monticola* Lowrie & N.G.Marchant (1992)
***Drosera moorei* (Diels) Lowrie (1999)**
***Drosera murfetii* Lowrie & Conran (2014)**
***Drosera nana* Lowrie (2014)**
Drosera nitidula subsp. *omissa* (Diels) N.G.Marchant & Lowrie (1992) ≡ *Drosera omissa* Diels
***Drosera nivea* Lowrie & Carlquist (1992)**
≡ *Drosera citrina* var. *nivea* (Lowrie & Carlquist) Schlauer (1996)
***Drosera orbiculata* N.G.Marchant & Lowrie (1992)**
≡ *Sondera orbiculata* (N.G.Marchant & Lowrie) Chrtek & Slavíková (2000)
***Drosera ordensis* Lowrie (1994)**
***Drosera oreopodion* N.G.Marchant & Lowrie (1992)**
***Drosera paradoxa* Lowrie (1997)**
***Drosera patens* Lowrie & Conran (2007)**
≡ *Drosera nitidula* var. *patens* (Lowrie & Conran) Schlauer (2007)
= *Drosera nitidula* subsp. *omissa* N.G.Marchant & Lowrie (1992) [auct., non Diels]
***Drosera pedicellaris* Lowrie (2002)**
≡ *Drosera parvula* var. *pedicellaris* (Lowrie) Schlauer (2021)
***Drosera* × *pingellyensis* Lowrie & Conran in Lowrie (2014)**
***Drosera prophylla* (N.G.Marchant & Lowrie) Lowrie (2014)**
≡ *Drosera marchantii* subsp. *prophylla* N.G.Marchant & Lowrie (1992)
***Drosera prostrata* (N.G.Marchant & Lowrie) Lowrie (2005)**
≡ *Drosera stolonifera* subsp. *prostrata* N.G.Marchant & Lowrie (1992)
***Drosera prostratoscaposa* Lowrie & Carlquist (1990)**
***Drosera roseana* N.G.Marchant & Lowrie (1992)**
≡ *Drosera paleacea* subsp. *roseana* (N.G.Marchant & Lowrie) Schlauer (1996)
***Drosera rupicola* (N.G.Marchant) Lowrie (2005)**
***Drosera salina* N.G.Marchant & Lowrie (1992)**

≡ *Sondera salina* (N.G.Marchant & Lowrie) Chrtek & Slavíková (2000)
***Drosera sargentii* Lowrie & N.G.Marchant (1992)**
≡ *Drosera parvula* subsp. *sargentii* (Lowrie & N.G.Marchant) Schlauer (1996)
***Drosera schmutzii* Lowrie & Conran (2008)**
***Drosera* × *sidjamesii* Lowrie & Conran (2007)**
***Drosera silvicola* Lowrie & Carlquist (1992)**
≡ *Drosera barbigera* subsp. *silvicola* (Lowrie & Carlquist) Schlauer (1996)
***Drosera spilos* N.G.Marchant & Lowrie (1992)**
***Drosera stelliflora* Lowrie & Carlquist (1992)**
≡ *Drosera paleacea* subsp. *stelliflora* (Lowrie & Carlquist) Schlauer (1996)
Drosera stolonifera subsp. *porrecta* (Lehm.) N.G.Marchant & Lowrie (1992) ≡ *D. porrecta* Lehm.
***Drosera trichocaulis* (Diels) Lowrie & Conran in Lowrie (2014)**
≡ *Drosera paleacea* subsp. *trichocaulis* (Diels) N.G.Marchant & Lowrie (1992)
***Drosera tubaestylis* N.G.Marchant & Lowrie (1992)** [in Lowrie (1987) as "tubaestylus"]
≡ *Sondera tubaestylis* (N.G.Marchant & Lowrie) Chrtek & Slavíková (2000)
***Drosera verrucata* Lowrie & Conran in Lowrie (2014)**
***Drosera walyunga* N.G.Marchant & Lowrie (1992)**
Drosera whittakeri subsp. *praefolia* (Tepper) Lowrie (1989) = *D. paefolia* Tepper
***Drosera zigzagia* Lowrie (1999)**
Polypompholyx westonii (P.Taylor) Lowrie (1989) = *Utricularia westonii* P.Taylor
Utricularia sect. *Minutae* Lowrie, Cowie & Conran (2008) = *U.* sect. *Enskide* (Raf.) P.Taylor
***Utricularia jobsonii* Lowrie (2014)**
***Utricularia paulineae* Lowrie (1998)**
***Utricularia petertaylorii* Lowrie (2002)**
***Utricularia simmonsii* Lowrie, Cowie & Conran (2008)**
Triggerplants (synonymy following ALA.org)
***Levenhookia murfetii* Lowrie & Conran (2011)**
***Stylidium aceratum* Lowrie & Kenneally (1998)**
***Stylidium adenophorum* Lowrie & Kenneally (1997)**
***Stylidium albolilacinum* (F.L.Erickson &J.H.Willis) Lowrie & Carlquist (1991)**
***Stylidium amphora* Lowrie & Kenneally (2017)**
Stylidium barrettiorum Lowrie & Kenneally (1997) = *Stylidium leptorrhizum* F.Muell.
***Stylidium bindoon* Lowrie & Kenneally (2017)**
***Stylidium burbidgeanum* Lowrie & Kenneally (1997)**

Stylidium candelabrum **Lowrie & Kenneally (1999)**
Stylidium carlquistii **Lowrie (1991)**
Stylidium chiddarcoopingense **Lowrie, D.J.Coates & Kenneally (1999)**
Stylidium cilium **Lowrie, A.H.Burb. & Kenneally (1999)**
Stylidium clarksonii **Lowrie & Kenneally (1997)**
Stylidium coatesianum **Lowrie & Carlquist (1991)**
Stylidium costulatum **Kenneally & Lowrie (1994)**
Stylidium cymiferum **Lowrie & Carlquist (1991)**
Stylidium daphne **Lowrie & Kenneally (1998)**
Stylidium diceratum **Lowrie & Kenneally (1998)**
Stylidium diplectroglossum **(F.L.Erickson & J.H.Willis) Lowrie, A.H.Burb. & Kenneally (1999)**
Stylidium diuroides **subsp.** ***paucifoliatum*** **Lowrie & Carlquist (1991)**
Stylidium drummondianum **Lowrie & Carlquist (1991)**
Stylidium edentatum **Lowrie & Carlquist (1989)**
Stylidium exappendiculatum **(Lowrie & Carlquist) Wege (2012)**
≡ *Stylidium emarginatum* subsp. *exappendiculatum* Lowrie & Carlquist (1991)
Stylidium fimbriatum **Lowrie & Kenneally (1996)**
Stylidium flagellum **Lowrie, A.H.Burb. & Kenneally (1999)**
Stylidium glabrifolium **Lowrie & Kenneally (1997)**
Stylidium hortiorum **Lowrie & Kenneally (2000)**
Stylidium ireneae **Lowrie & Kenneally (1998)**
Stylidium kalbarriense **Lowrie & Kenneally (1997)**
Stylidium keigheryi **Lowrie & Carlquist (1991)**
Stylidium latrodectus **R.L.Barrett, M.D.Barrett & Lowrie (2015)**
Stylidium leeuwinense **Lowrie & Kenneally (1997)**
Stylidium maritimum **Lowrie, D.J.Coates & Kenneally (1998)**
Stylidium marradongense **Lowrie & Kenneally (1997)**
Stylidium megacarpum **Lowrie, A.H.Burb. & Kenneally (1999)**
Stylidium mimeticum Lowrie & Carlquist (1991) = *Stylidium calcaratum* R.Br.
Stylidium monticola **Lowrie & Kenneally (2017)**
Stylidium mucronatum **Lowrie & Kenneally (1997)**
Stylidium nitidum **Lowrie & Kenneally (2017)**
Stylidium paulineae **Lowrie & Kenneally (1998)**
Stylidium perizostera **Lowrie & Kenneally (1997)**
Stylidium pingrupense **Lowrie, A.H.Burb. & Kenneally (1999)**
Stylidium ponticulus **Lowrie & Kenneally (2017)**

***Stylidium prophyllum* Lowrie & Kenneally (1997)**
***Stylidium pseudosacculatum* Lowrie, A.H.Burb. & Kenneally (1999)**
***Stylidium pulviniforme* Lowrie & Kenneally (1994)**
***Stylidium rivulosum* Lowrie & Kenneally (1997)**
***Stylidium saintpaulioides* R.L.Barrett, M.D.Barrett & Lowrie (2015)**
***Stylidium salmoneum* Lowrie & Kenneally (2017)**
***Stylidium sejunctum* Lowrie, D.J.Coates & Kenneally (1998)**
***Stylidium semaphorum* Lowrie & Kenneally (1997)**
***Stylidium septentrionale* (Mildbr.) Lowrie, A.H.Burb. & Kenneally (1999)**
Stylidium sidjamesii Lowrie & Kenneally (2000) = *Stylidium inundatum* R.Br.
***Stylidium strigosum* Lowrie & Kenneally (2017)**
***Stylidium tinkeri* Lowrie & Kenneally (2000)**
***Stylidium torticarpum* Lowrie & Kenneally (1997)**
***Stylidium trudgenii* Lowrie & Kenneally (2004)**
***Stylidium turbinatum* Lowrie & Kenneally (1997)**
***Stylidium turleyae* Lowrie & Kenneally (2004)**
***Stylidium tylosum* Lowrie & Kenneally (1997)**
***Stylidium udusicol*a Lowrie & Kenneally (1997)**
***Stylidium vinosum* Lowrie & Kenneally (2017)**
***Stylidium warriedarense* Lowrie, A.H.Burb. & Kenneally (1999)**
***Stylidium weeliwolli* Lowrie & Kenneally (1998)**
***Stylidium willingii* R.L.Barrett, Kenneally & Lowrie (2015)**
***Stylidium wilroyense* Lowrie, D.J.Coates & Kenneally (1998)**

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In memory of a friend and colleague

I would like to conclude with a few personal remarks on Allen Lowrie: I started corresponding with Allen about carnivorous plants in 1993. Allen was my first international CP correspondent, when my English skills were those of a 13-year-old high school kid (which I was at that time). So a nice side-effect of my botanical penpalship with Allen was, that – besides the incredible amount of knowledge on Australian plants shared by him – I additionally learnt from him some, let's say, nonstandard expressions of the English language (mainly Australian swear words; I can spot at least one or two of them in every of his letters, even when he spoke about rather general

subjects – a thrifty use in his respect, as I was able to realize later when spending a few days with him driving the car on a common field trip in Western Australia). Needless to say, that I did not find most of these words in the thick English dictionary that assisted me while reading his letters at the time. My personal correspondence with Allen started as hand-written letters exchanged between the two of us every few months (when enough botanical questions and discussion topics had accumulated that were worth spending postage for a letter to Duncraig, Western Australia) for many years, until it switched to the cutting-edge technology of fax in the late 90s. Actually, Allen was the only person ever I chatted with by fax. But those times were great fun, as Allen's latest news from W Australia usually arrived at the dead of night on the other half of the globe in Germany. And as the family's old fax machine was placed quite close to my bedroom door, I was usually right awake when news to read from down-under arrived with chattering and bleeping sound at my place at about 4 a.m. That was also the usual time of the day when his occasional phone calls arrived for me, which often started with Allen yelling: "*Bloody hell, must be awfully late at your place! I did not expect you're up now*". Well, I usually wasn't until you called, mate. These enjoyable times will always be well-remembered, because our correspondence got much more straightforward when Allen finally discovered e-mail by the end of 2004 (at that time, he

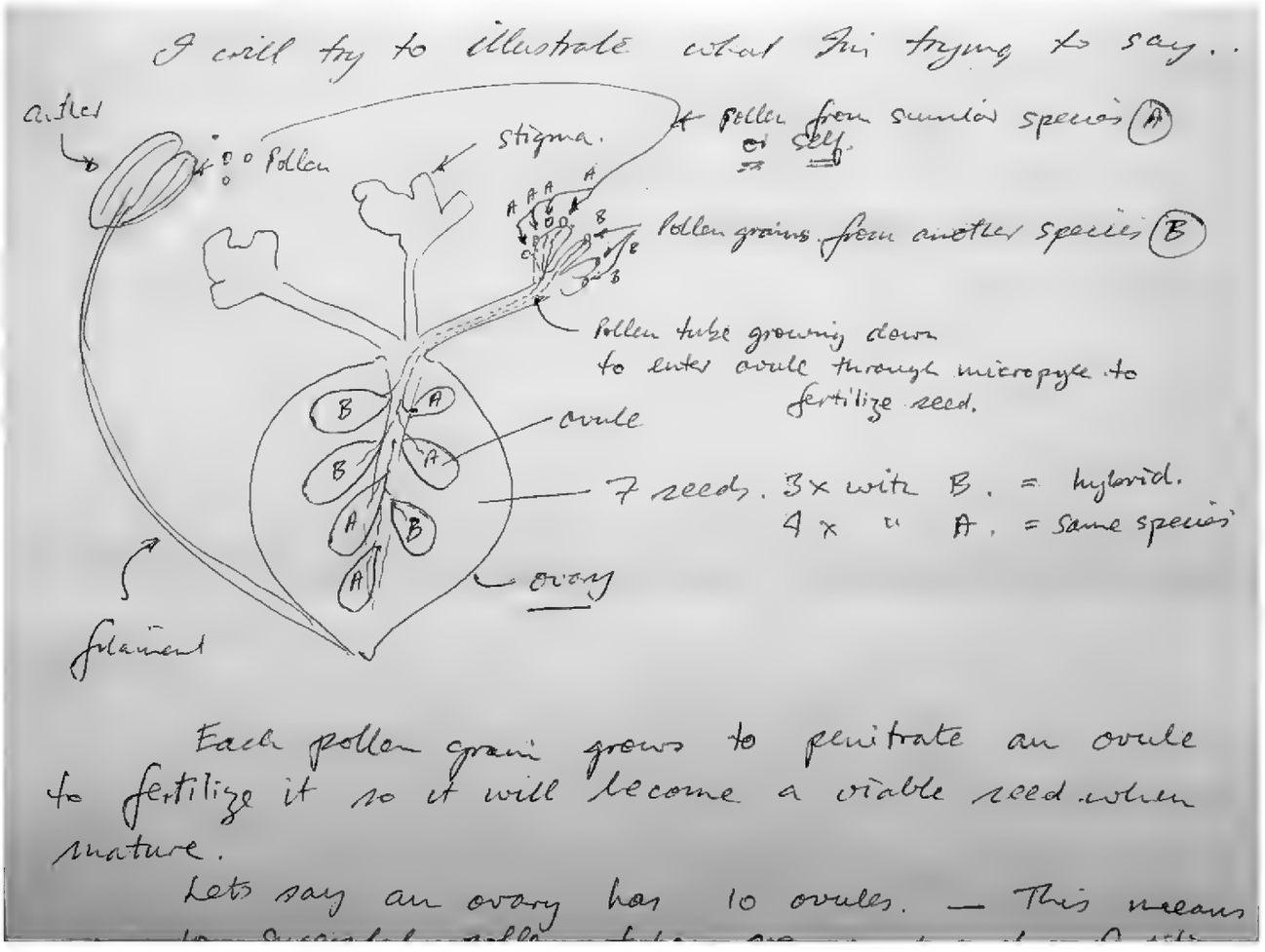

Figure 3: A sketch from Allen Lowrie's hand to illustrate pollination in the *Drosera petiolaris* complex, from a letter sent to me in March 2000 when we were discussing the hybrid interfertility of this intricate group. Allen was assuming some selfing potential in *D.* sect. *Lasiocephala* at the time, a theory that we could later falsify based on my cultivation experiments (all species from that affinity except for *D. banksii* and *D. subtilis* have proven self-incompatible, so are obligate outbreeders). This sketch and the matter illustrated by it finely demonstrate Allen's intimate knowledge of botany.

provided his e-mail contact only confidentially, thus chatting with him by e-mail felt a bit like an elusive club). Interestingly, in the first years of e-mail correspondence with Allen, his communication did not differ much from fax, as he sent scanned images of handwritten letters. I have to admit that, for good old times, I printed these "early Allen e-mails" (I did not do so with the conventional e-mails he sent later) to be archived together with the earlier handwritten letters and faxes in my "Allen Lowrie correspondence" folders – filling 4 large folders in my bookshelf with about 20 years of botanical communication. I still read in these notes from time to time, as they are a valuable archive of unpublished information (as well as a colloquial addition to my standard English dictionary), all written in Allen's easily recognizable and well-legible handwriting, quite often accompanied with some detailed drawings from his hands to illustrate some of the thoughts or botanical issues we were just discussing (Fig. 3). We were not always sharing the same opinion and casually enjoyed some animated discussions (occasionally about plant taxonomy, but unavoidably when it came to his business of selling Australian wild flora), but these were always fair arguments respecting each other as good friends.

I was also fortunate enough to meet Allen personally on four occasions: at the ICPS conferences in Sydney in 2008, in Leiden in 2010, and Cairns in 2014. The biggest adventure however was a 4-day personal fieldtrip with Allen in October 2008 in SW Western Australia following that years' ICPS conference – during this short trip, Allen showed me more than 100 different plant species in natural habitat, including many type localities of species he discovered, as well as a few new species that were still unnamed at that time. The last two CP species I encountered in Western Australia in 2008 were seen on the fly right at the last day of my visit, when Allen kindly drove me to Perth Airport to catch my flight back home: he decided that enough time was left before check-in to stop by the type locality of *Drosera porrecta* at Kings Park (see Fig. 4), as well as to say goodbye to the last c. 20 remaining individuals of *Byblis gigantea* at Perth Airport ground, at an area that already got developed back then and from where *Byblis* is fully extinct today. During my stay in Perth, I also enjoyed his and Pauline's kind hospitality, which must have been overstressed a bit as my visit coincided with the day of Allen's 60th birthday. I felt quite embarrassed to have dropped in right on his great day which, instead of celebrating with his family, he spent with a foreign plant nerd exploring carnivorous plant habitats around Perth (place names which sound familiar to every pygmy *Drosera* lover, such as: York, The Lakes, Walyunga N.P., Muchea). From that day on, I always re-

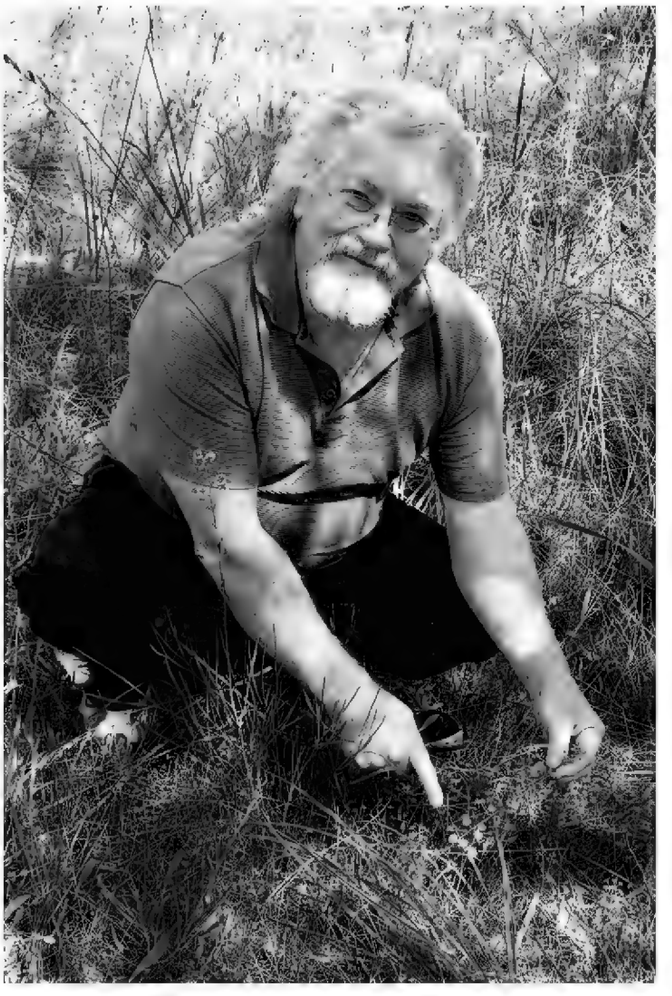

Figure 4: Allen Lowrie showing a few remaining individuals of *Drosera porrecta* at the species' historic type locality at Mount Eliza, Kings Park, Perth, 14 Oct. 2008. One of the two Australian originals pictured here is now sadly missed forever. Photograph by A. Fleischmann.

membered his birthday, and on every October 10th sent my wishes and exchanged some botanical chit-chat with him.

The day of his 72nd birthday in 2020, Allen replied to me: "*I'm still working in the botanical field and loving it. Earlier this year I was planning a long trip from Perth to Darwin but this bloody virus got in the way. I planned to hook up the caravan and slowly work my way up to Darwin botanising the living daylights out of the bush along the way real slow like. Hopefully I can get moving on this in 2021*."

Today, I want to finish my long personal correspondence with Allen Lowrie with a last message faxed out to him: *Allen, I hope you will be able to enjoy an endless botanical field trip on the other side. Thank you so much for everything, mate! Your friend Andreas*.

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Allen Lowrie's definitive work on Australian Carnivorous Plants - Carnivorous Plants of Australia Magnum Opus

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In her 1968 volume 'Plants of Prey', Rica Erickson made the first attempt to consolidate the complete known roster of Australia's carnivorous plants into one single work. For two decades this was the standard on the topic, however during that time many new species were discovered and taxonomic issues solved. Allen Lowrie's original 3 volume work, 'Carnivorous Plants of Australia', released in 1987, 1989, and 1998, was at the time an enormous achievement and was the benchmark reference that made it possible for naturalists, carnivorous plant enthusiasts and botanists to identify specimens in the field. For the first time colour images of every species were included and many new species described since Erickson's work were added. Even as his original 3 volume work was completed, it was out of date, something acknowledged in Volume 3. The obvious gap was the *Utricularia* of northern Australia, but Lowrie was a great believer in getting the work out there and then over time adding to it as new information and discoveries became available. In discussions with Allen in the early 2000s it became obvious that his first books were merely a placeholder for what was to be a more complete treatment of Australia's carnivorous plants and the culmination of his life's work.

In 2014, after 35 years of research and publishing, 'Carnivorous Plants of Australia Magnum Opus' was released. Over 3 volumes, 1371 pages and 2573 images, Allen treated all known Australian taxa at the time. There were new combinations, new records, new taxonomic states, synonyms re-elevated to species level, new sections, and the description of several new species: 1 *Byblis*, 16 *Drosera*, 1 *Utricularia*, as well as new *Drosera* hybrids. Each species entry had a first page containing a full botanical description, distribution, habitat, flowering period, etymology, affinities, and notes. The second page displayed Allen's botanical line drawings, highlighting important characters for each species. The third page showed a satellite distribution map, as well as a key to the multiple images on the fourth page. In addition to the species covered, there was a wealth of other information including, habitat and ecology, historical accounts, comprehensive keys, sections on flowers and gemmae, and a biography of all the authors of Australian carnivorous plant species. Quite simply this was the definitive work on Australia's carnivorous plants and a testament to the life work of Allen Lowrie.

Lowrie's Magnum Opus in comparison to his original Carnivorous Plants of Australia.

Even as Magnum Opus was released it was already out of date, such is the amount of unexplored habitat on the vast Australian continent. Allen's intention was to release a fourth volume to cover the new discoveries that he and others were working on, however as his health declined this project was never completed.

To commemorate the legacy of Magnum Opus and Allen Lowrie, this edition of Carnivorous Plant Newsletter has compiled over the following 3 papers a complete list of new Australian carnivorous plants published since 2014. The authors are acutely aware that as we go to print, this treatment is already out of date but hope that it adds to the store of knowledge left to us by Allen Lowrie.

New Australian *Drosera* taxa published since Allen Lowrie's Magnum Opus

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Allen Lowrie's Magnum Opus provided a major taxonomic revision of Australian *Drosera* L. (Droseraceae), describing 16 new species, four new natural hybrids, elevating ten former subspecies to species-level and resurrecting 12 species from synonymy (Lowrie 2014: 1268-1281). In addition, the true identities of several formerly widely misidentified species such as *D. dichrosepala* Turcz. and *D. paleacea* DC. were established. This revision is now widely accepted by flora checklists and taxonomic authorities at regional (e.g., the Western Australian Census; Percy-Bower & Parker 2019, see also https://florabase.dpaw.wa.gov.au/), national (Australian Plant Census; https://biodiversity.org.au/nsl/services/search/taxonomy), and international (e.g., World Checklist of Selected Plant Families; https://wcsp.science.kew.org) levels. Only one species described in the Magnum Opus, *D. coalara* Lowrie & Conran of *D.* section *Bryastrum* Planch. (pygmy sundews), has since proven to represent a synonym and is now placed under *D. citrina* Lowrie & Carlquist (Krueger & Fleischmann 2020).

Taxonomy is an ever-changing field. New observations from the wild, herbaria and cultivation are constantly updating our understanding of many taxa and new species continue to be discovered at rapid pace. Since the publication of the Magnum Opus, six new *Drosera* taxa were formally described from Australia, comprising four new species and two new infraspecific taxa. Only one taxon, *D. gunniana* (Planch.) de Salas has been resurrected from synonymy and elevated to species-level (de Salas 2018). Of these seven newly described or resurrected taxa, three belong to *Drosera* section *Ergaleium* (DC.) Planch.[1] (tuberous sundews) while the remaining four are placed in *D.* section *Arachnopus* Planch. ("*D. indica* L. complex"), *D.* section *Bryastrum* (pygmy sundews), *D.* section *Lasiocephala* Planch. (woolly sundews), and *D.* section *Prolifera* C.T.White ("Queensland sundews"). This raises the current number of recognized *Drosera* species in Australia to 161. Curiously, all seven taxa have been published by different authors (13 authors in total), highlighting a broad interest in Australian *Drosera* among taxonomists.

In the following, I provide a brief summary and discussion of all seven taxa described or resurrected since Allen Lowrie's Magnum Opus.

Drosera albonotata A.S.Rob., A.T.Cross, Meisterl & A.Fleischm. (2018) Fig. 1

A new species of *D.* section *Bryastrum* (pygmy sundews) from south-west Western Australia. It closely resembles *D. miniata* Diels, producing a compact ground rosette and large orange-metallic flowers bearing dark centers and three thread-like styles. However, the flowers of *D. albonotata* bear white basal patches on their petals, a feature that appears to be unique to this species and allows rapid identification when flowering. The specific epithet *albonotata* (from the Latin for "white marked") is a reference to this distinctive flower color pattern. The species occurs in lateritic or clayey soils in Wandoo woodlands or low heath approximately 50 to 150 km due east of Perth, in a region generally referred to as the Western Australian Wheatbelt. Habitat loss due to agricultural clearing has been severe in this area and *D. albonotata* is thus currently listed as Priority 2 (a potentially threatened species requiring urgent surveying effort) under Western Australian legislation (Western Australian Herbarium 1998–).

[1] Four tuberous sundew sections mentioned in the Magnum Opus (Erythrorhiza, Luniferae, Macrantha, and Stolonifera) were sunk into section Ergaleium by Fleischmann *et al*. (2018) based on molecular data.

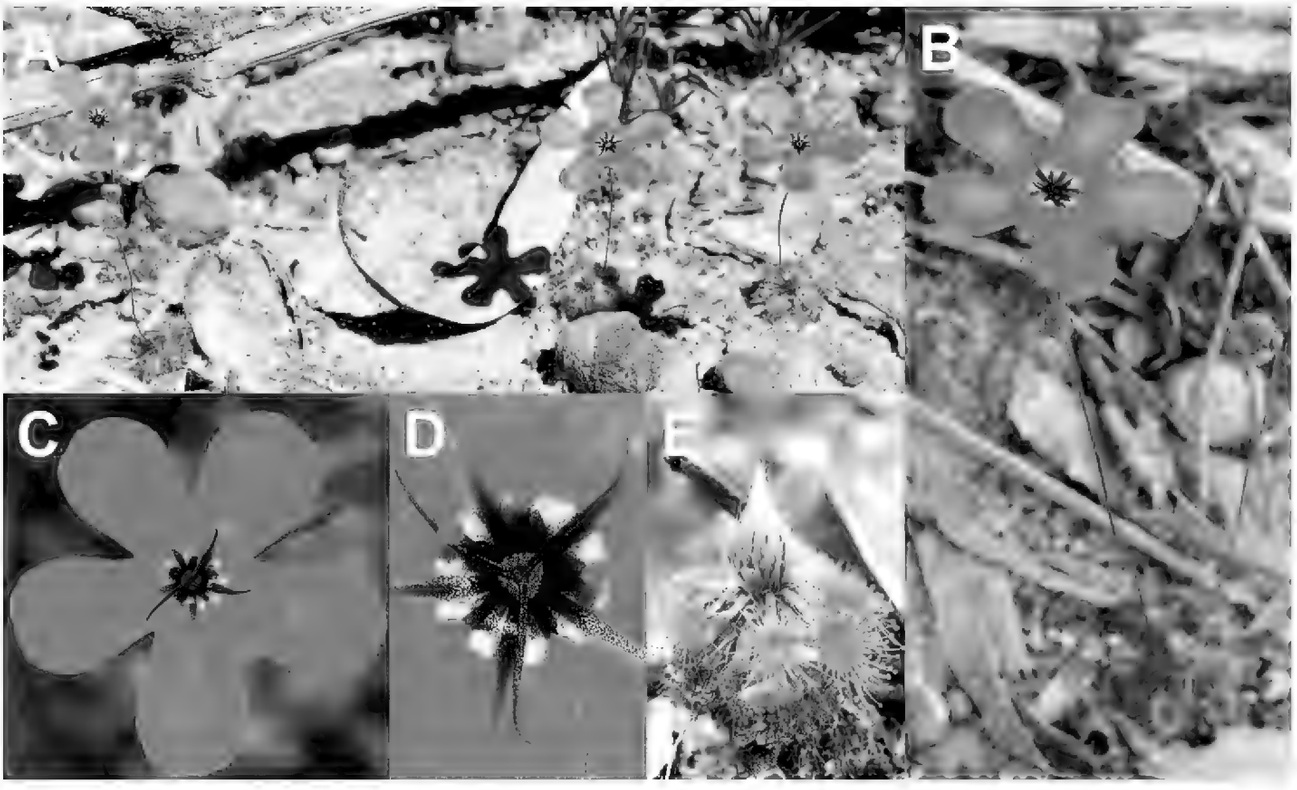

Figure 1: *Drosera albonotata* A.S.Rob., A.T.Cross, Meisterl & A.Fleischm. A: A group of plants in full flower near York, Western Australia; B: Habit. The flower is about twice the diameter of the rosette in this species; C: Flower; D: Close-up of the flower center. The characteristic white spots on the petal bases are clearly visible; E: Rosette with stipule bud. Photos: Thilo Krueger.

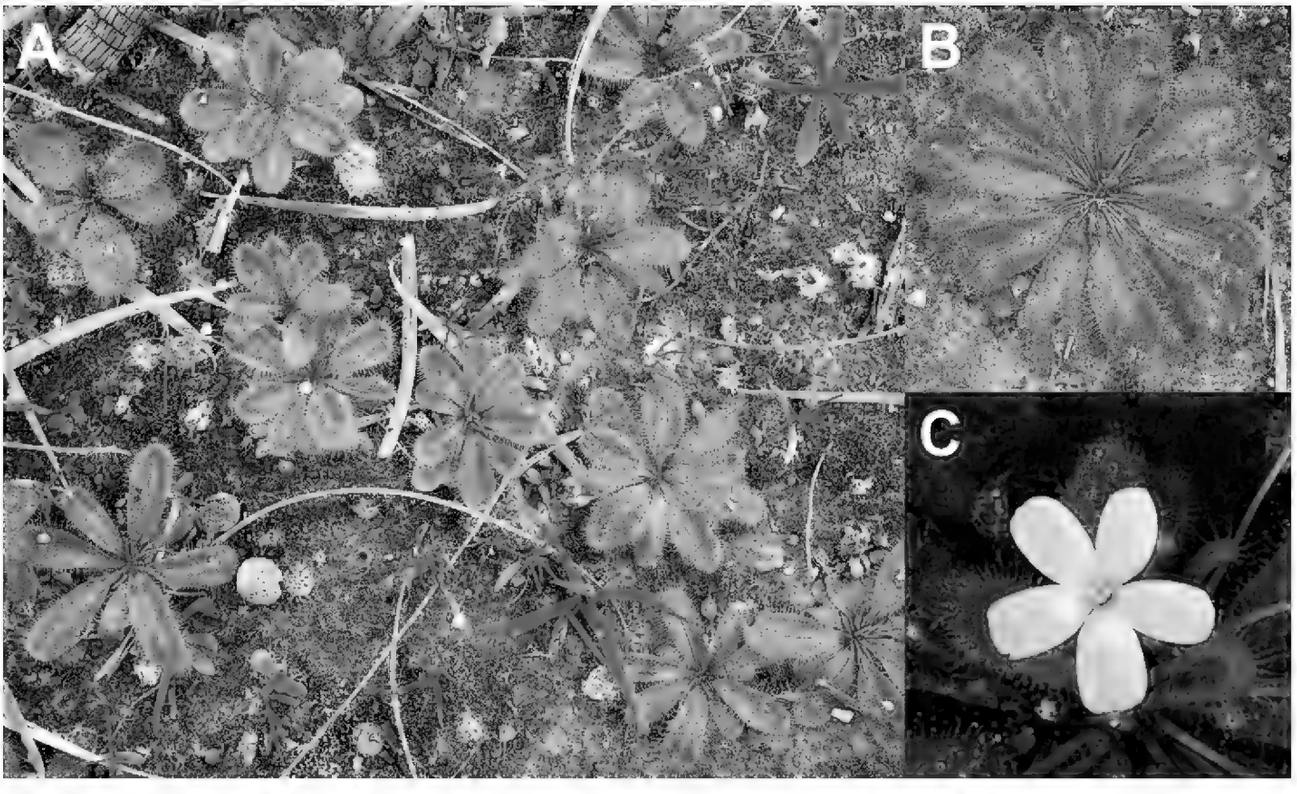

Figure 2: *Drosera bulbosa* subsp. *coronata* R.P.Gibson. A–B: Plants in full growth near Mingenew, Western Australia. The reddish leaf midribs contrast strongly with the overall olive-green leaves (Photos: Thilo Krueger); C: Close-up of the flower, note the yellow pollen color and crown-like style arrangement (Photo: Richard Nunn).

Drosera bulbosa* subsp. *coronata R.P.Gibson (2013) Fig. 2

A new subspecies in *D.* section *Ergaleium* (tuberous sundews) from south-west Western Australia. This subspecies can be distinguished from *D. bulbosa* Hook. subsp. *bulbosa* and *D. major* (Diels) Lowrie by its striking olive-green leaf coloration with prominent red leaf midribs. Its flowers are also distinctive, featuring an annulus of short style segments around the top of the ovary and yellow pollen (*D. bulbosa* subsp. *bulbosa* and *D. major* have style segments evenly distributed on top of the ovary and white pollen). The subspecific epithet *coronata* refers to this characteristic crown-like style arrangement. This subspecies grows in loamy soils in *Acacia* woodlands at the bases of steep slopes and near river margins. It is only known from two locations near the small Wheatbelt towns of Mingenew and Mullewa, around 300 to 400 km north of Perth. Due to the few known locations, this taxon is currently listed as Priority 2 (a potentially threatened taxon requiring urgent surveying effort) under Western Australian legislation (Western Australian Herbarium 1998–).

Drosera buubugujin M.T.Mathieson (2020) Fig. 3

A new species of *D.* section *Prolifera* (Queensland sundews) from the south-eastern Cape York Peninsula in Queensland. While morphologically very similar to *D. schizandra* Diels, it can be most easily distinguished by its more narrow (usually oblanceolate) leaf shape, much longer inflorescences (which are up to 42 cm long *vs*. up to 15 cm long in *D. schizandra*) and white pollen (yellow-orange pollen in *D. schizandra*). In addition, *D. buubugujin* features smaller flowers (only ca. 0.5 cm in diameter) and less bilobed anthers than *D. schizandra*. The specific epithet *buubugujin* refers to the Buubu Gujin Aboriginal Corporation lands upon which the only known herbarium specimens were collected by the authors in collaboration with the Traditional Owners of the area. This species grows on the sandstone escarpments north north-west of Cooktown, generally in sandy soils with moss along the banks of streams in forested areas. It is only known from two small populations in close proximity to each other which may be threatened by inappropriate fire regimes and invasive

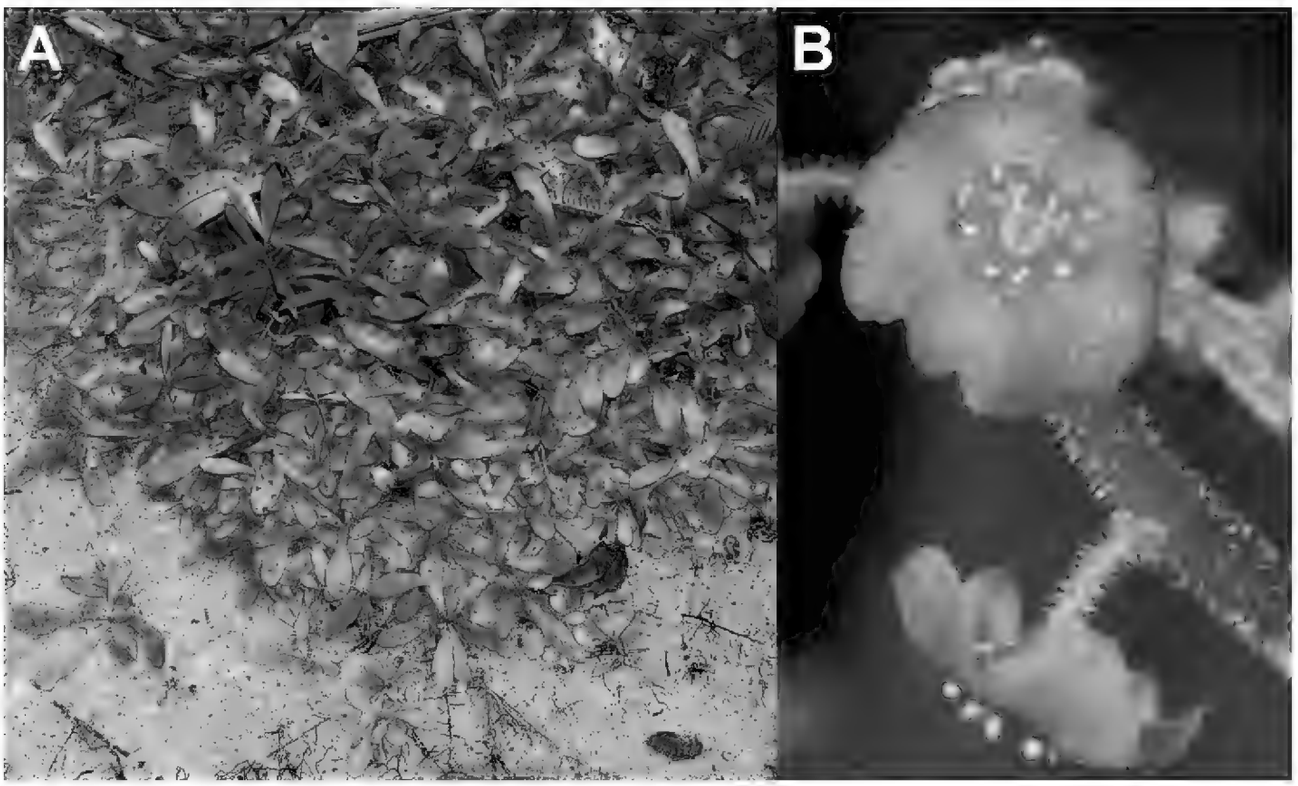

Figure 3: *Drosera buubugujin* M.T.Mathieson. A: A colony of plants growing on a stream bank in Muundhi National Park, Queensland; B: Close-up of the flower. Photos: Michael T. Mathieson.

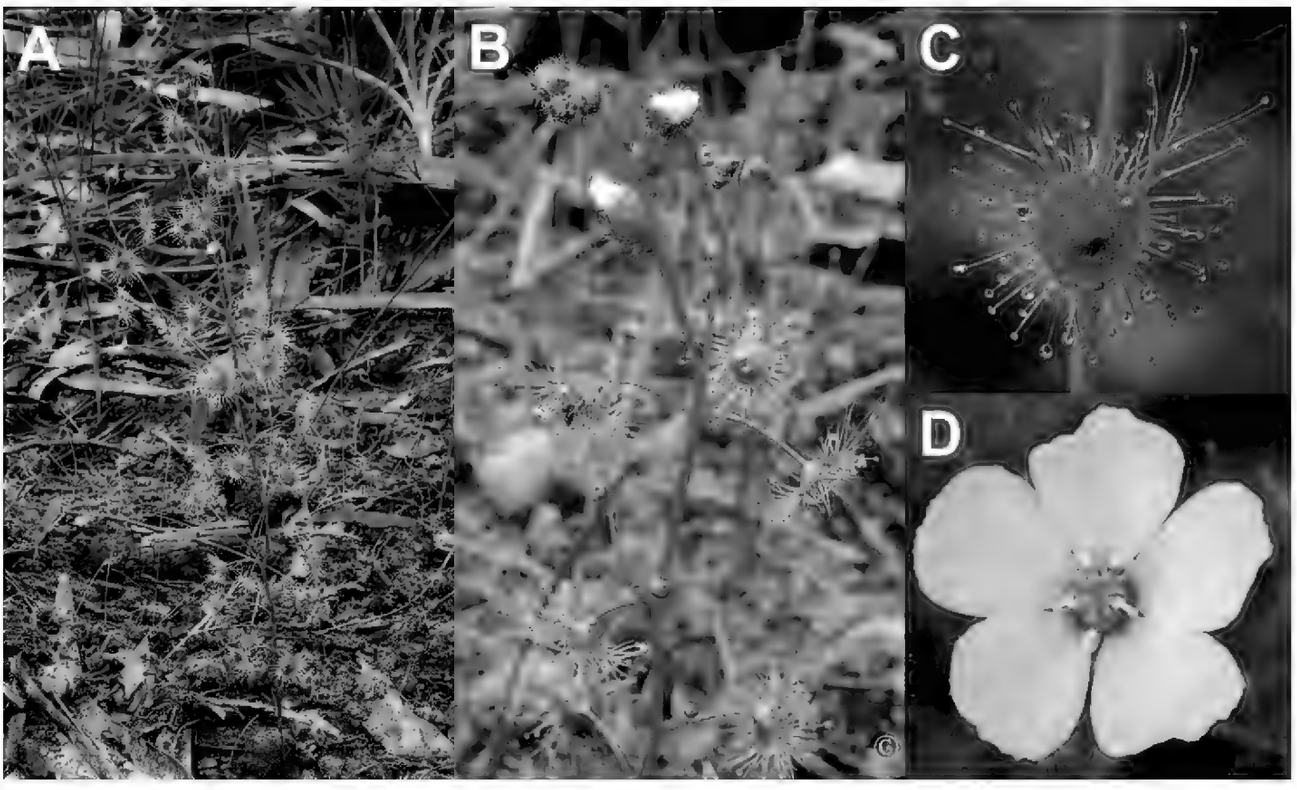

Figure 4: *Drosera gunniana* (Planch.) de Salas. A–B: Habit of flowering plants near Adelaide, South Australia. The relatively long stem that may only be branched near the top is characteristic for this species. Also note the hairy sepal indumentum; C: Close-up of the lamina; D: Close-up of a white flower. Photos: Richard Nunn.

grasses. *Drosera buubugujin* has thus been listed as Critically Endangered under Queensland's legislation (Queensland Department of Environment and Science 1995-2021).

Drosera gunniana (Planch.) de Salas (2018) Fig. 4

A newly resurrected and elevated taxon of *D.* section *Ergaleium* from south-east Australia and New Zealand. Previously often confused (or included) with *D. hookeri* R.P.Gibson, B.J.Conn & Conran or *D. peltata* Thunb., this species can be distinguished by its 8-22 cm tall, usually solitary stem, yellow-green basal rosettes, inflorescences arising only from near the top of the stem, and its often pink flower color. By contrast, *D. hookeri* is a much shorter plant which usually branches from near its base and always has white flowers while *D. peltata* has very slender stems and reddish basal rosettes. This species is widely distributed in New South Wales, South Australia, Tasmania, and Victoria where it grows in a range of grassy habitats at low to mid elevations. In addition, plants from the Northland Peninsula in New Zealand (which were previously known as *D. peltata* or *D. hookeri*) have recently been confirmed to represent *D. gunniana* (de Lange 2021). This species appears to be relatively common across a large geographic area and is thus unlikely to be currently threatened.

Drosera huegelii* var. *phillmanniana Y.-A.Utz & R.P.Gibson (2017) Fig. 5

A new subspecies in *D.* section *Ergaleium* from Stirling Range National Park in south-west Western Australia. This variety differs from *D. huegelii* Endl. var. *huegelii* mainly by its much smaller size, reaching a maximum of only 12 cm (*vs*. up to 50 cm in *D. huegelii* var. *huegelii*) and only producing 1-3 flowers per plant (*vs*. 3-20 flowers per plant in *D. huegelii* var. *huegelii*). The epithet *phillmanniana* honors Phillip (Phill) Mann (1951-2014), a Western Australian carnivorous plant enthusiast and taxonomist who recognized the distinctiveness of this taxon and brought it to the attention of the authors.

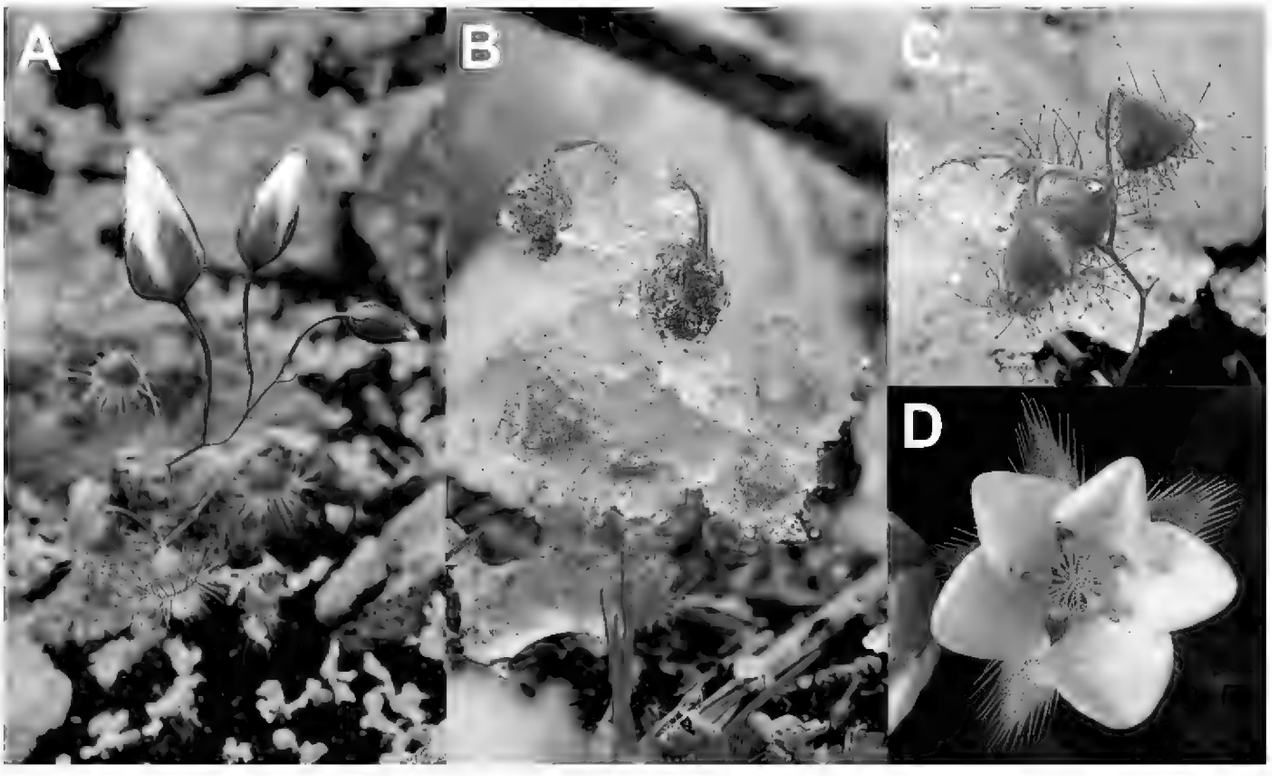

Figure 5: *Drosera huegelii* var. *phillmanniana* Y.-A.Utz & R.P.Gibson. A: Habit of a flowering plant in Stirling Range National Park, Western Australia (Photo: Thilo Krueger); B: Flowering plant enclosed in ice and snow following a strong cold front on 17 August 2019 (Photo: Thilo Krueger); C: Close-up of the strongly bell-shaped leaves of this taxon (Photo: Thilo Krueger); D: Flower (Photo: Yves-Andre Utz).

Drosera huegelii var. *phillmanniana* is only known from the highest mountains of the Stirling Range, occurring above ca. 800 m elevation in open, wind-exposed montane heath. This habitat, which the taxon shares with *D. monticola* (Lowrie & N.G.Marchant) Lowrie, is known for being the only place in Western Australia that regularly experiences light frost and snow during winter and spring. As this is also the growing and flowering time of *D. huegelii* var. *phillmanniana*, it is possible to find plants enclosed in ice and snow during this time (Fig. 5). Only known from very few populations across a limited range, this taxon has been listed as Priority 2 (a potentially threatened taxon requiring urgent surveying effort) under Western Australian legislation (Western Australian Herbarium 1998–).

Drosera margaritacea T.Krueger & A.Fleischm. (2021) Fig. 6

A new species of *D.* section *Arachnopus* ("*D. indica* complex") from the Kimberley region of northern Western Australia. Previously often confused with *D. finlaysoniana* Wall. ex Arn., this species can be readily distinguished by its enormous, up to 65 cm tall inflorescence often bearing 50 or more relatively large flowers (which are up to 3 cm in diameter). Its shortly petiolate leaves bear 20-50 translucent-white stalked secretive glands near their bases that produce potentially resinous mucilage drops which do not desiccate even in dried herbarium specimens. The specific epithet *margaritacea* (from the Latin for "pearl-bearing") refers to this distinctive type of gland, as well as to the swollen, yellow-colored anther connective extensions. *Drosera margaritacea* occurs in beige to red sandy soils (Pindan) amongst dense grassy vegetation near seasonally wet swamps, creeks, and seepages. Its distribution covers a large part of the western Kimberley region, ranging from the base of the Dampier Peninsula in the west to near Fitzroy Crossing in the east and northwards to the Yampi Peninsula. Given this relatively wide distribution and large population sizes reported from several locations, this species is not currently considered to be threatened.

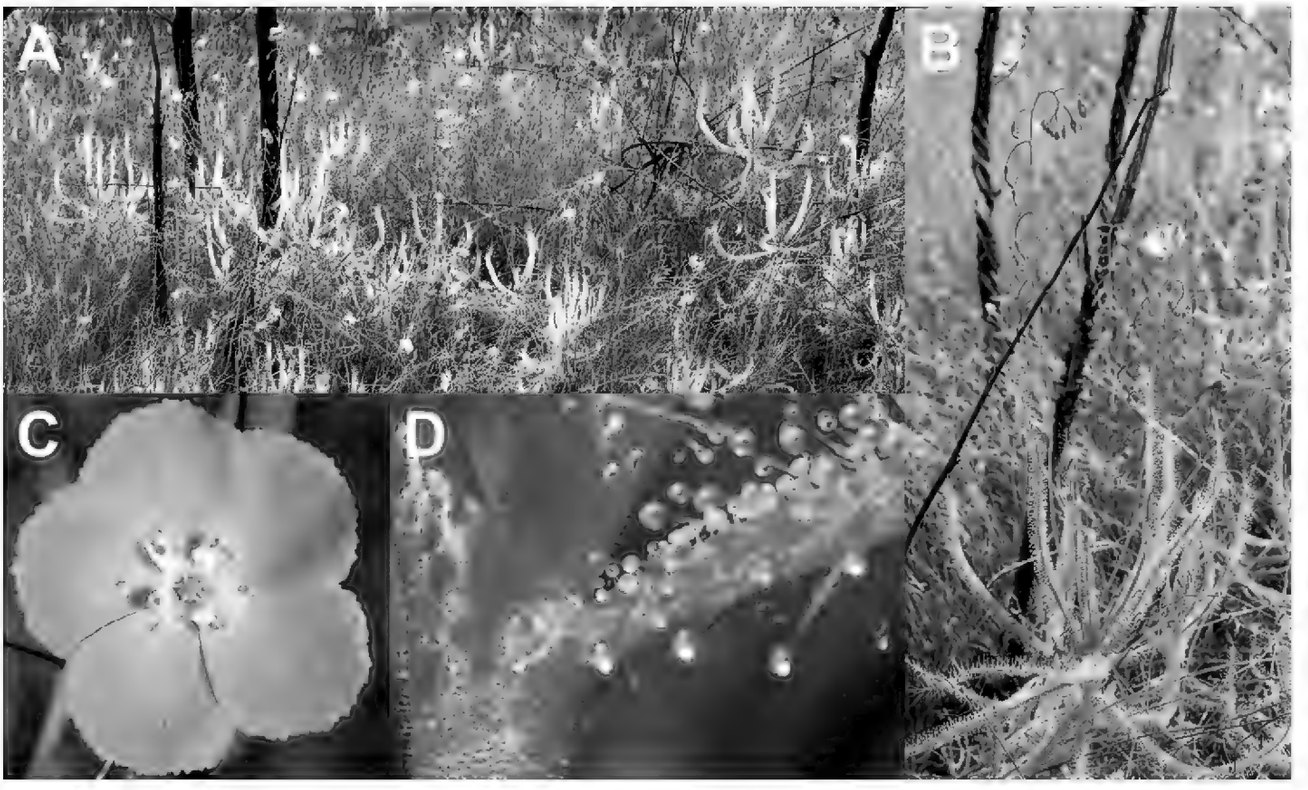

Figure 6: *Drosera margaritacea* T.Krueger & A.Fleischm. A: A large population of this species growing near Derby, Western Australia; B: Habit. Note the upright, exceptionally long, and many-flowered inflorescences; C: Flower with the swollen, yellow-colored anther connective extensions clearly visible; D: Close-up of the distinctive translucent-white stalked secretive glands which cover the adaxial petiole surface. Photos: Thilo Krueger.

Figure 7: *Drosera stipularis* Baleeiro, R.W.Jobson & R.L.Barrett. A: Habit of a plant growing in its typical sandy habitat near Cooktown, Queensland; B: Rosette; C: Close-up of the flower. Photos: Paulo C. Baleeiro.

Drosera stipularis Baleeiro, R.W.Jobson & R.L.Barrett (2020) Fig. 7

A new species of *D.* section *Lasiocephala* (woolly sundews or "*D. petiolaris* R.Br. ex DC. complex") from the Cape York Peninsula in Queensland. This species is morphologically very similar to *D. petiolaris* but can be differentiated by its almost pygmy-sundew-like appearance, producing slender stems covered with previous season's growth and unusually prominent stipules (hence the specific epithet *stipularis*). However, its inflorescence closely resembles *D. petiolaris*, although it lacks any hairy indumentum below the buds and bears shorter pedicels. *Drosera stipularis* grows in moist white sand within low heath and sedges. While only known from two localities north of Cooktown, it is not currently considered to be threatened (Queensland Department of Environment and Science 1995-2021).

Acknowledgments: Richard Nunn, Michael T. Mathieson, Paulo C. Baleeiro and Yves-Andre Utz are thanked for providing photographs of the recently described *Drosera* taxa. I would also like to thank Andreas Fleischmann, Allen Lowrie, Richard Nunn, Greg Bourke, Manfred Meisterl, and Alastair Robinson for fruitful discussions on Australian *Drosera* taxonomy over the past decade.

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New Australian *Nepenthes* taxa published since Allen Lowrie's Magnum Opus

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Nepenthes L. is a genus comprising at least 160 accepted species chiefly distributed in Southeast Asia, with centres of diversity in Borneo, Sumatra, and the Philippines, with disjunctions in Madagascar, Sri Lanka, India, Seychelles, New Caledonia, and Australia (Clarke *et al.* 2018).

The number of *Nepenthes* species recorded in Australia has changed greatly since the days of Bailey (1881, 1897, 1898, 1899, 1905) and von Mueller (1866) who reported 11 species, and Danser (1928) who subsequently reduced them to synonyms of *N. mirabilis* (Lour.) Druce. Treatments of the genus by Stanley (1982), Jebb and Cheek (1997), and Cheek and Jebb (2001) followed Danser. Clarke and Kruger (2005), after viewing Bailey's original type material held at Brisbane Herbarium (BRI) and detailed field observations, re-instated one of Bailey's collections, *N. rowaniae* F.M.Bailey, as a distinct species. Whilst completing these field studies Clarke and Kruger encountered a *Nepenthes* taxon that was not readily identifiable and didn't match any herbarium specimens, which they concluded was a new species and described *N. tenax* C.Clarke & R.Kruger in 2006. Lowrie (2014) supported three species, *N. mirabilis*, *N. rowaniae*, and *N. tenax* in Magnum Opus and this treatment remained the accepted protocol until 2016, when a fourth Australian species was described, *Nepenthes parvula* G.W.Wilson & S.Venter.

Nepenthes parvula G.W.Wilson & S.Venter 2016

Clarke & Kruger (2006) found a single population of a "small form" of *Nepenthes tenax* growing in a permanently-inundated site in a swamp on the flood plain of the Jardine River and they observed that this form "bears the smallest functional aerial pitchers of any *Nepenthes*" with pitchers that are "at most 50 mm high". Other personal accounts of this diminutive taxon have been recorded after field studies of the Jardine River area. The authors of this new taxon (Wilson & Ventor 2016) conducted several field surveys in northern Queensland during the Dry Season (May to November) from 2010-2015 to northern Cape York. The population of the proposed new taxon appeared clearly distinct from *N. tenax* on basis of morphological and ecological characteristics and lead to its formal description in 2016.

Figure 1: *Nepenthes parvula* growing in Sanamere Lagoon, Cape York, Queensland, Australia. Photo by Richard Nunn.

Nepenthes parvula is an erect subshrub 0.35(−0.50) m tall (Fig. 1). The epithet *parvul*a refers to the small size of mature plants. *Nepenthes parvula* occurs in Queensland, Cape York only growing on freshwater swamps in the lower Jardine River catchment

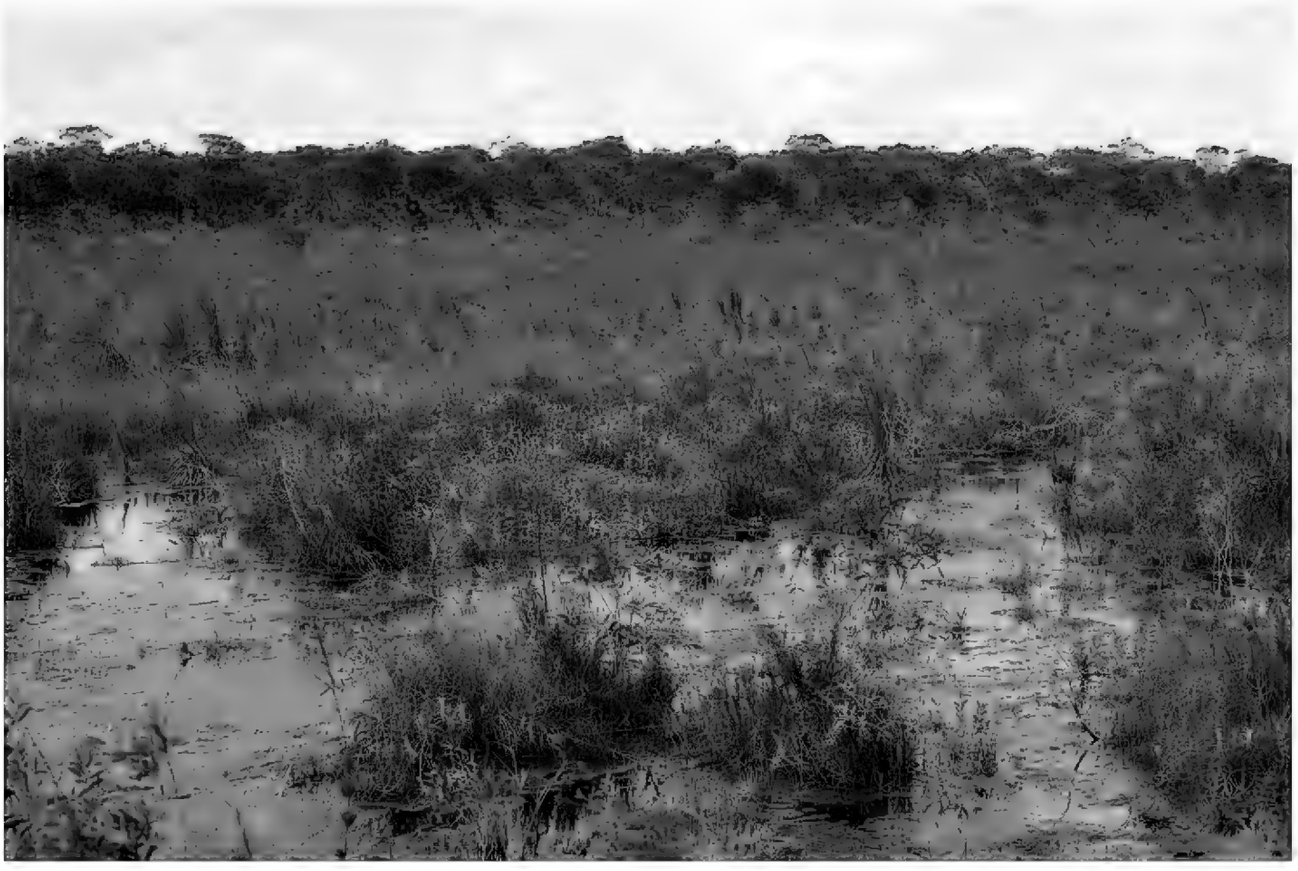

Figure 2: Typical habitat for *Nepenthes parvula*, Sanamere Lagoon, Cape York, Queensland, Australia. Photo by Richard Nunn.

(Fig. 2). This ecosystem does not burn in the wildfires that irregularly but not infrequently sweep across the landscape and as result *N. parvula* is characterised by a retained "skirt" of lower pitchers. *Nepenthes parvula* is similar to *N. tenax* from which it differs in having small aerial pitchers (35-60 × 10-15 mm), red colour of the upper surface of the lid on aerial pitchers, more dense nectar glands (250-300 per cm^2 vs. 100-150 per cm^2) on the abaxial surface of the pitcher lid, smaller male flower, much shorter mature fruit, and restriction to an ever-wet environment.

Robinson (2020) in Flora of Australia suggests the principally size-based distinction is poorly supported genus-wide given the inherent variability of even single species populations studied across the range of the genus, and in-situ comparisons of *N. tenax* and *N. parvula* found that it was sometimes challenging to distinguish between them, with various intergrades noted (A. Robinson, pers. obs).

However, Wilson and Venter (2016) indicate that the ecology of this taxon is distinct, and that plants of *N. tenax* and *N. parvula* grown under identical conditions respond differently, particularly in terms of their temperature tolerances (Wilson & Venter 2016). It is worth noting that the Sulawesian *N. minima* is likewise separated from *N. maxima* based primarily on its diminutive dimensions, appearing otherwise much like its larger counterpart, but genetic analyses seem to support this separation (Nauheimer *et al*. 2019) and similar analyses of the Australian *Nepenthes* taxa may provide valuable insight into the quality of their separation.

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New Australian *Utricularia* taxa published since Allen Lowrie's Magnum Opus

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At the time of completion of Magnum Opus by the end of 2013, the genus *Utricularia* L. (Lentibulariaceae) contained approximately 240 monographed species worldwide (Taylor 1989, Fleischmann 2012, 2015, Lowrie 2014), with 66 of these found in Australia (Lowrie 2014). The genus is divided into the three subgenera *Polypompholyx*, *Bivalvaria*, and *Utricularia* (sensu Müller & Borsch 2005) with Lowrie's Australian roster recognising 40 species in subgenus *Polypompholyx*, 15 species in subgenus *Bivalvaria* and 11 in subgenus *Utricularia*.

Since Magnum Opus, there has been much further study of Australian *Utricularia* lead by Australian Botanist, Richard Jobson, of the Royal Botanic Garden Sydney, (Jobson 2013, Jobson & Baleeiro 2015, 2020, Jobson *et al*. 2018, Jobson & Cherry 2020, Jobson & Davies-Colley 2020), adding a further 21 new species and subspecies to Lowrie's roster of Australian *Utricularia*. Two have been resurrected, one species, *Utricularia monanthos* Hook.f. (= *U. dichotoma subsp monanthos* (Hook.f.) R.W.Jobson) has been revised and *U. corneliana* R.W.Jobson has been reduced to synonomy with *U. reflexa* Oliv.(Fleischmann 2015), leaving a total of 88 currently recognised taxa found in Australia.

This paper will provide a brief treatment of the newly described and reinstated Australian *Utricularia* species and subspecies since Lowrie's seminal work, Carnivorous Plants of Australia, Magnum Opus (Lowrie 2014).

Utricularia adamsii R.W.Jobson & Davies-Colley 2020

Small perennial, suspended or affixed aquatic herb (Fig. 1). The specific epithet honours Laurence George Adams (1929-2014), a researcher at the Australian National Herbarium, who in March 1967 collected the first known specimen of *U. adamsii* near Darwin, Northern Territory. Known only from four locations, one on Cape York and three sites near Darwin (Fig. 1). Similar to *U. aurea* Lour., but differs in shape and length of rhizoid float appendages (20-30 mm v. 50-100 mm long), corolla spur always glabrous and longer than the corolla lower lip v. spur hairy and shorter or equal in length to the corolla lower lip.

Utricularia albertiana R.W.Jobson & Baleeiro 2018

Small annual, affixed subaquatic herb (Figs. 2 & 24). The specific epithet honours Prof. Victor A. Albert, botanist and evolutionary biologist in the Department of Biological Sciences at the University at Buffalo, State University of New York, who has contributed immensely to our understanding of the genus *Utricularia*. Known from three locations in the Northern Kimberley region, Western Australia. Found growing in shallow pools on sandstone pavement and outcrops. Previously confused with *U. dunstaniae* F.E.Lloyd from the Northern Territory and differs in having spur apex rounded/obtuse, central corolla lower lip lobe longer than the spur, calyx lower lip almost as long as the spur, and trap dorsal appendage usually present.

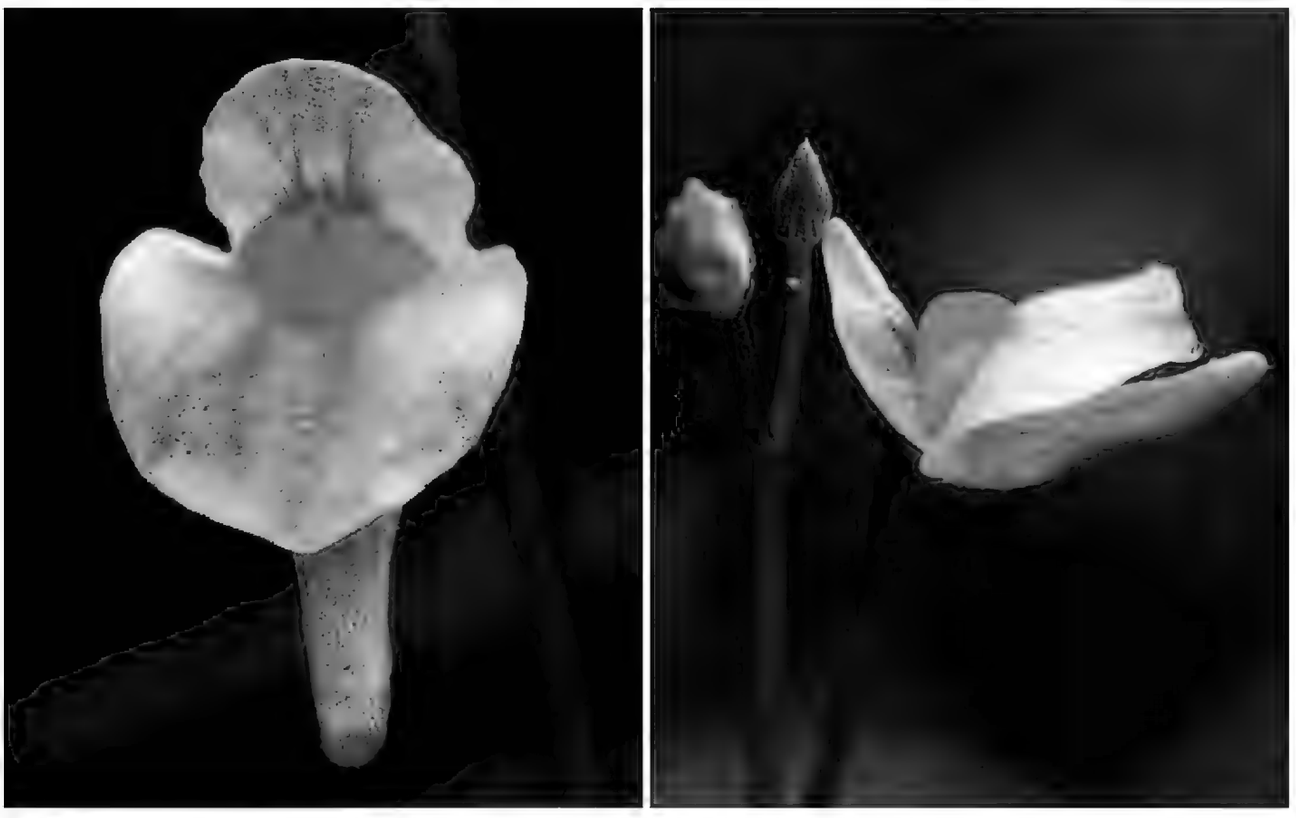

Figure 1: *Utricularia adamsii* flower frontal view (image R. Nunn); flower lateral view (image G. Bourke).

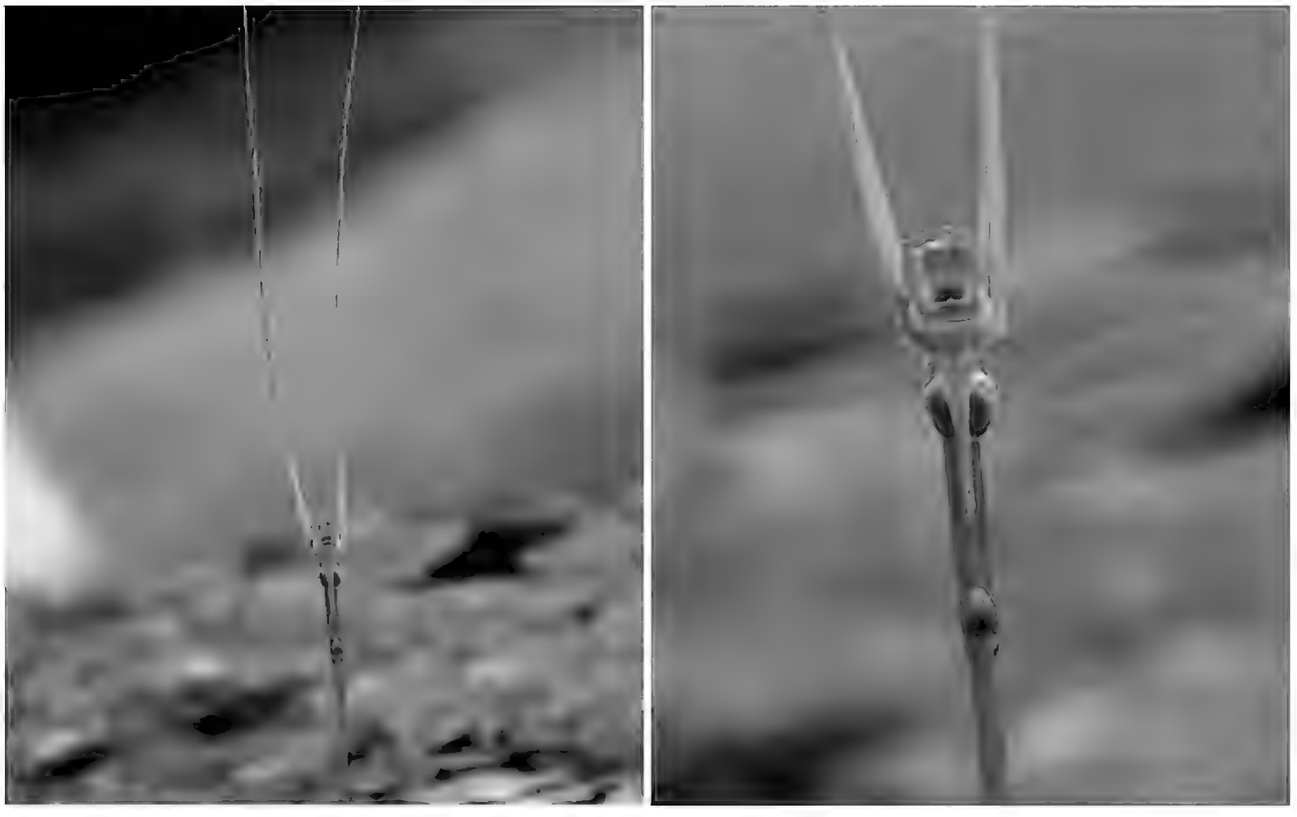

Figure 2: *Utricularia albertiana* flower frontal view (image R. Nunn); closeup view of same flower.

Utricularia ameliae R.W.Jobson 2013

Small perennial, terrestrial herb (Fig. 3). The specific epithet refers to Miss Amelia Pieternella Jobson, daughter of the author of this species, Richard Jobson. Only found in Elizabeth Springs, Queensland, situated in the Diamantina River Catchment on the flood-plain of Spring Creek. Elizabeth Springs forms part of the Springvale group of artesian discharge springs. Colonies of *Utricularia ameliae* are scattered throughout the permanently wet sedgeland bog habitat. This species differs from *U. dichotoma* Labill. with presence of bracts and bracteoles that are basally non-gibbous; spur tapers to an acutely bifid apex; white corolla upper lip.

Utricularia barkeri R.W.Jobson 2013

Small to medium-sized perennial, terrestrial herb (Fig. 4). The specific epithet refers to Dr William (Bill) R. Barker, former Chief Botanist of the State Herbarium of South Australia (AD), who has made significant contributions to Australian botany with studies of Australasian Scrophulariaceae and various other families. Distributed on flat coastal areas of South Australia, Victoria, and west coast of Tasmania, usually at or near sea level. *Utricularia barkeri* occupies coastal ephemeral sedge swampland and heath soakage on deep sand. This species differs from *U. dichotoma* with presence of basiolute bracts with upper and lower lobes of ±equal length; corolla upper lip light mauve with purple flecks.

Utricularia beaugleholei subsp. ***orientalis*** R.W.Jobson 2020

Small to medium-sized perennial, terrestrial herb, stolon tubers often present (Fig. 5). The subspecific epithet is from the Latin *orientalis* (of the east) and refers to the mostly eastern geographic distribution relative to subsp. *beaugleholei*. Distributed in the Eastern Highlands and Riverina regions of Victoria, extending onto the South-Western Slopes and Southern Tablelands of New South Wales. Occurs in sand and clay along seasonally wet creeks and farm dam soaks, and in nearby grasslands and pasture. *Utricularia beaugleholei* subsp. *orientalis* resembles the larger subspecies of *U. dichotoma* in overall size and shape of flowers, and Taylor's (1989) use of *Darbyshire 514* (a specimen of *U. beaugleholei* subsp. *orientalis*) for floral illustration of *U. dichotoma* has led to confusion in the field.

Utricularia bidentata R.W.Jobson & Baleeiro 2018

Small to medium-sized probably annual, terrestrial herb (Fig. 6). The specific name is from the Latin *bi-* (two) and *dentatus* (toothed) and refers to the two white, prominently raised ridges that project forward from the palate resembling two sharp teeth. Widespread across the Kimberley region from Broome to Mitchell Plateau, Western Australia, with localised disjunct occurrences at Nitmiluk, Northern Territory. Although the disjunction between Western Australia and Northern Territory populations involves ~800 km, habitat is similar, with plants infrequent along edges of rocky or sandy creeks, among grasses and sedges. This species was previously confused with *Utricularia kimberleyensis* C.A.Gardner with the differences involving colour of the palate spot (yellow / orange vs cream), and size of the two central ridges at the base of the corolla lower lip (not raised relative to adjacent ridges vs prominently raised relative to adjacent ridges). The two species tend to differ in habitat, with *U. bidentata* often occurring on soils with a high clay content, including cracking clay plains, while *U. kimberleyensis* typically grows in alluvial silt on sand flats derived from sandstone.

Figure 3: *Utricularia ameliae* flower frontal view; flower lateral view (images G. Bourke).

Figure 4: *Utricularia barkeri* flower frontal view (image R. Nunn); flower lateral view (image D. Cullen).

Figure 5: *Utricularia beaugleholei* subsp. *orientalis* flower frontal view; flower lateral view (images R. Nunn).

Figure 6: *Utricularia bidentata* flower frontal view; flower lateral view (images T. Krueger).

Utricularia byrneana R.W.Jobson & Baleeiro 2015

Small to medium-sized perennial, terrestrial herb (Fig. 7). The specific epithet honours Dr Geoff Byrne who recognised the uniqueness of this species and made the first known collection of *Utricularia byrneana*. Recorded from two swamps in Western Australia on the Dampier Peninsula, separated by approximately 100 km. This species is locally common inhabiting shallow edges of ephemerally wet swamps and lagoons. Similar to *U. fistulosa* P.Taylor, but differs in having leaves lanceolate, corolla mauve with two raised yellow ridges at base, corolla spur cylindrical, apex rounded, shorter than lower lip, seeds cylindrical, trap dorsal appendage short.

Utricularia dichotoma subsp. ***aquilonia*** R.W.Jobson 2020

Terrestrial perennial herb (Fig. 8). The subspecific epithet is from the Latin *aquilonius* (north, northerly) and refers to the mostly North Coast and Northern Tablelands geographic distribution. Known only from New South Wales, where it is found in upland swamps and creeks of the Central and Northern Tablelands and heathland swamps of the North Coast. Distinguished from *Utricularia dichotoma* by the bracts and bracteoles that are strongly gibbous versus spurred.

Utricularia dichotoma subsp. ***fontana*** R.W.Jobson 2020

Terrestrial perennial or annual herb (Fig. 9). The subspecific epithet is from the Latin *fontanus* (of a spring or fountain), alluding to the habitat of most known populations. Occurs in central Queensland in recharge springs of the Great Artesian Basin and in mountain creeks and springs of the Blackdown Tablelands, in the Moreton region where it is found in ephemerally wet coastal creek gullies in open woodland, and in New South Wales where it is found in semipermanent springs along creeks of the North Western Slopes and Northern Tablelands. Differs from other members of the *Utricularia dichotoma* complex by the corolla spur which is curved forward near the apex and is longer than the corolla lower lip. This long, forward-curved spur is conspicuous and consistent.

Utricularia dichotoma subsp. ***maritima*** R.W.Jobson 2020

Terrestrial perennial herb (Fig. 10). The subspecific epithet is from the Latin *maritimus* (of the sea), referring to the usually coastal habitat and distribution. Widespread from the Darling Downs of Queensland, south to Victoria and Tasmania and west as far as Kangaroo Island in South Australia. Found mostly in heathy swamps and associated creeks on coastal slopes and plains. Can be discriminated from all other subspecies of *Utricularia dichotoma* in having an apically acute basal spur on the bracts and bracteoles versus either spur-less or spur apically rounded or truncate.

Utricularia dichotoma subsp. ***novae-angliae*** R.W.Jobson 2020

Emergent aquatic annual herb (Figs. 11 & 25). The subspecific epithet is from the Latin *nova* (new), and *Anglia* (England), referring to its distribution in the New England Bioregion of the Northern Tablelands of New South Wales. Occurs in shallow, semi-permanent montane swamps over clay loam on basalt substrates between Uralla and Llangothlin on the Northern Tablelands of New South Wales. This taxon differs from all other subspecies of *Utricularia dichotoma* having an emergent habit, long, linear leaves, and a conical corolla spur that is less than half the length of the lower lip.

Utricularia dichotoma subsp. ***oxleyensis*** R.W.Jobson 2020

Terrestrial perennial herb (Fig. 12). The subspecific epithet refers to the Oxley Wild Rivers National Park located in the Northern Tablelands region of New South Wales. Known only from four

sites between Ebor and the Carrai Plateauin the Oxley Wild Rivers National Park, New South Wales. Occurs in seasonally moist heathy swamps on peatysubstrate, at 880-1500 m altitude. This taxon differs from all other subspecies of *Utricularia dichotoma* having a terrestrial habit, small, ovate leaves, a straight corolla spur, and distinctly hatchet-shaped corolla lower lip.

Figure 7: *Utricularia byrneana* flower frontal view; flower lateral view (images T. Krueger).

Figure 8: *Utricularia dichotoma* subsp. *aquilonia* flower frontal view; flower lateral view (images R. Nunn).

Figure 9: *Utricularia dichotoma* subsp. *fontana* flower frontal view; flower lateral view (images R. Nunn).

Figure 10: *Utricularia dichotoma* subsp. *maritima* flower frontal view (image R. Nunn); flower lateral view (image G. Bourke).

Figure 11: *Utricularia dichotoma* subsp. *novae-angliae* flower frontal view; flower lateral view (images R. Nunn).

Figure 12: Putative *Utricularia dichotoma* subsp. *oxleyensis* flower frontal view; flower lateral view. The plant's location and floral characters strongly support this diagnosis; however, this is a poorly known subspecies (images Greg Bourke).

Utricularia fenshamii R.W.Jobson 2013

Small to medium-sized perennial, terrestrial herb (Fig. 13). The specific epithet refers to Associate Prof. Roderick Fensham of the School of Biological Sciences, The University of Queensland, and the Queensland Herbarium, who has contributed greatly to our knowledge of the biology and ecology of the mound springs distributed across the Great Artesian Basin. This species is restricted to wetlands associated with discharge mound springs across the Great Artesian Basin. A specimen of this taxa was collected by C.W. Burgh de Birch (circa 1871) and was sent to Ferdinand von Mueller as "*Utricularia*" sp. until determined as *U. dichotoma* by Peter Taylor in 1985. This species differs from *U. dichotoma* with presence of bracts and bracteoles that are basally non-gibbous; corolla lower lip central ridge twice the length of neighbouring ridges.

Utricularia gaagudju R.W.Jobson & Cherry 2020

Medium-sized, probably annual, terrestrial herb (Fig. 14). The specific epithet is a noun in apposition that refers to the Aboriginal language Gaagudju formerly spoken in Arnhem Land, in the vicinity, and the namesake of, Kakadu National Park. Found in the Northern Territory from Pine Creek to Jabiru, Daly Basin, and Darwin region. Also collected on Bathurst and Melville Islands. Grows in silty areas near boggy creeks with sedges and grasses. *Utricularia gaagudju* was previously confused with *U. kimberleyensis*, with the key difference involving colour of the corolla (light purple v. mauve), the margin of corolla lower lip (entire v. slightly three-lobed), the raised central palate ridges (yellow v. orange) the corolla spur (curved forward v. straight), and the peduncle (basal third hispid v. glabrous).

Utricularia grampiana R.W.Jobson 2013

Small to medium-sized probably annual, terrestrial herb (Fig. 15). The specific epithet refers to the Grampians National Park (Gariwerd) located in Victoria's western highland region. Within Victoria, *Utricularia grampiana* has a restricted distribution, all recorded collections represent populations protected within the Grampians National Park and Langi Ghiran State Park. Thus far restricted to high elevation (alt. 400-1170 m) on sandstone seepages in the Mt Difficult and Mt William Ranges within the Grampians National Park (Gariwerd), and in similar habitat at Mt Langi Ghiran. Usually forms small colonies among mosses and sedges in seepage areas on rock platforms. This species differs from *U. dichotoma* with presence of basiolute bracts with upper lobes about twice the length of lower; corolla upper lip cream with purple flecks.

Utricularia hamata R.W.Jobson & M.D.Barrett 2018

Small to medium sized possibly perennial, terrestrial or affixed subaquatic herb (Fig. 16). The specific epithet is from the Latin *hamatus* (shaped like a hook, hooked, crooked) and refers to the deflexing of the peduncle post anthesis. Known from only three sites in the Kimberley, Western Australia. In the north Kimberley (type location) it grows either as an emergent in deep pools of creek-line (20-30 cm) with sandstone substrate, or as a terrestrial on shallow sandy edges. At the Harding Range in the West Kimberley, it was found in a shallow creek on a sandstone pavement. In the Central Kimberley it was found growing within a herb field flat with *Melaleuca viridiflora*, in a wetland/chute area, with red-brown to dark brown clayey soil. Similar to *Utricularia hamiltonii* F.E.Lloyd but differs in having bifid lateral trap appendages, a white corolla, 2-lobes of upper lip limb rounded, corolla lower lip limb obovate, spur broadly conical, curved upwards with apex yellow.

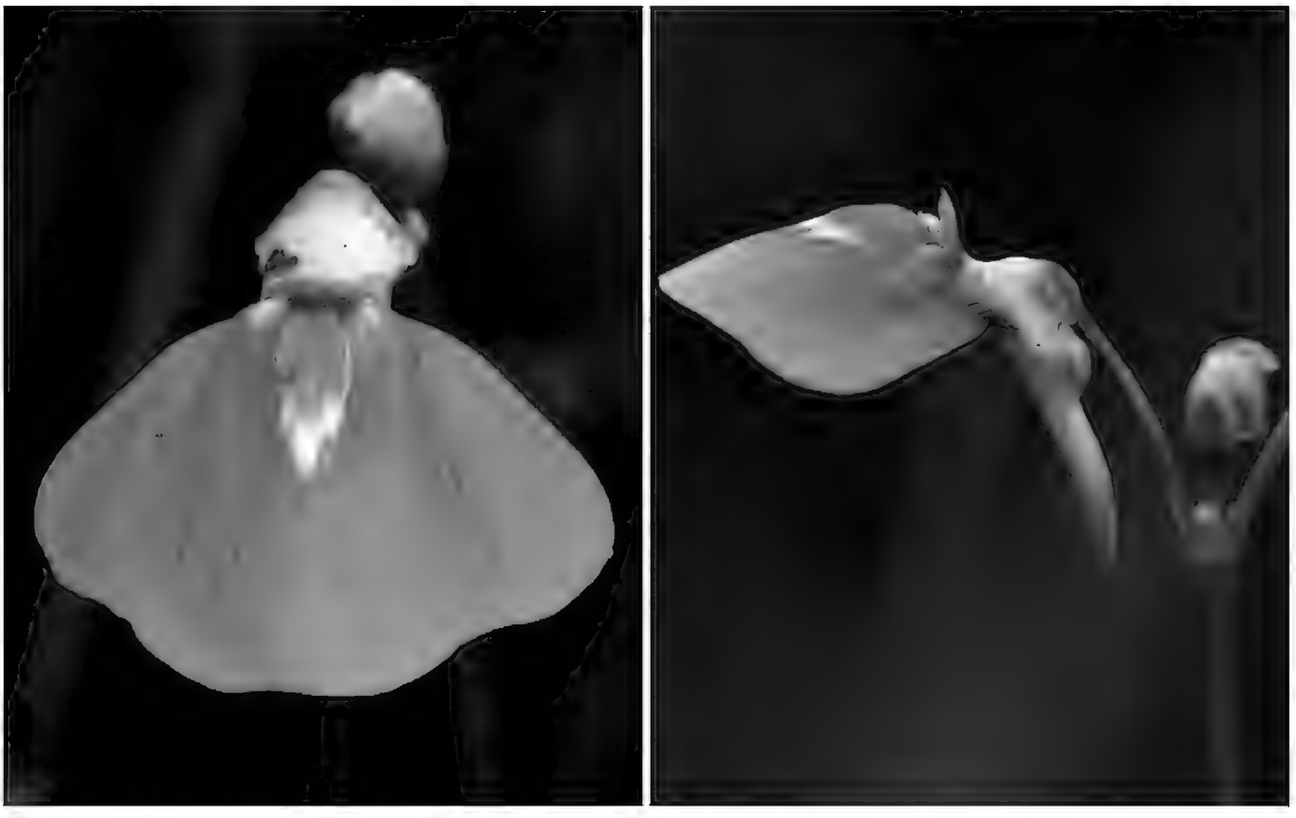

Figure 13: *Utricularia fenshamii* flower frontal view; flower lateral view (images G. Bourke).

Figure 14: *Utricularia gaagudju* flower frontal view; flower lateral view (images R. Nunn).

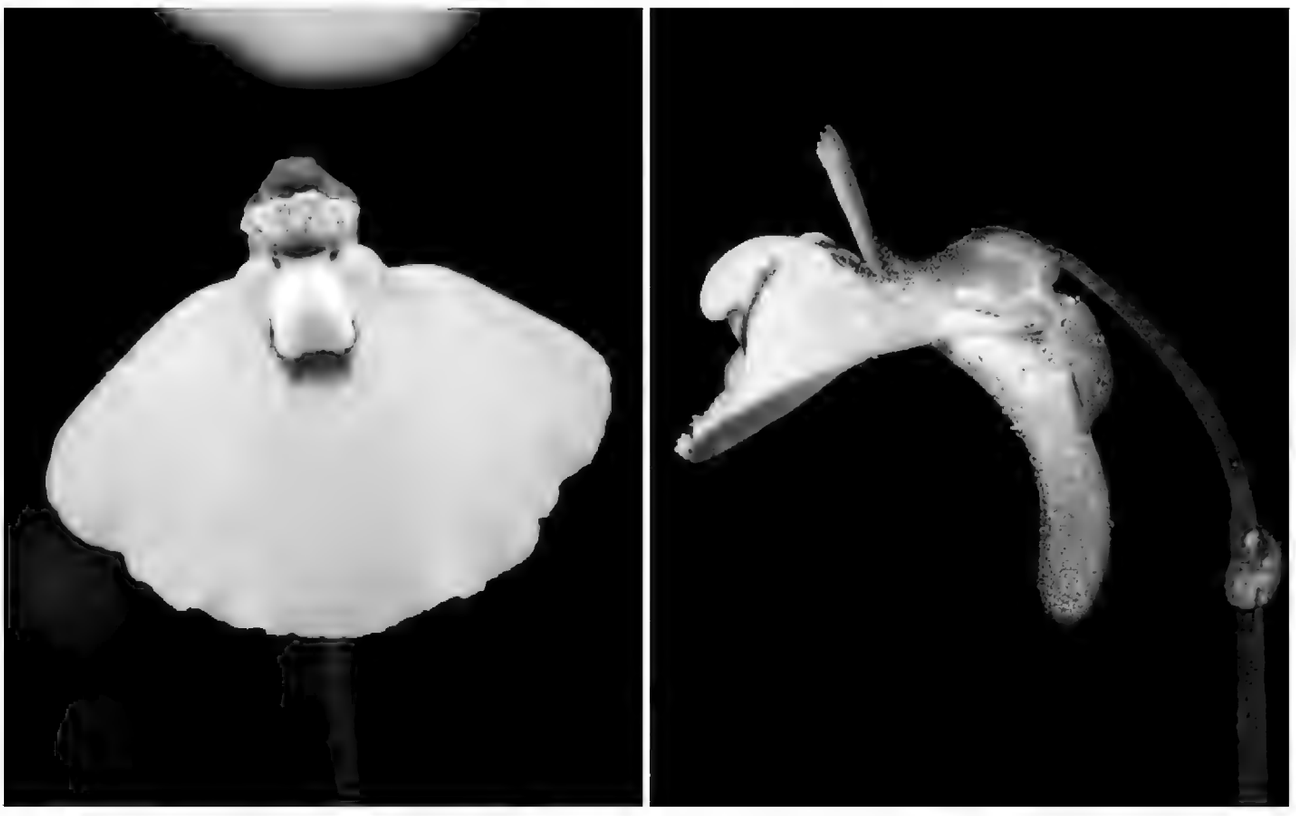

Figure 15: *Utricularia grampiana* flower frontal view (image R. Nunn); flower lateral view (image G. Bourke).

Figure 16: *Utricularia hamata* flower frontal view; flower lateral view (images T. Krueger).

Utricularia limmenensis R.W.Jobson

Very small sized annual, terrestrial herb (Fig. 17). The specific epithet refers to the region within the catchment of the Limmen Bight River, from which Limmen National Park takes its name. Known from two collections in the Limmen Bight River catchment, Northern Territory. The two collection sites are located ~50 km apart, one within Limmen National Park, and another located on private property. At both sites it is found on sandy clay substrate along the drying edge of *Melaleuca* dominated swamps. Similar to *Utricularia albiflora* R.Br. but differs in having a corolla pale violet, a narrow upper-lip limb slightly constricted near middle, corolla lower-lip limb strongly three-lobed, and spur long, cylindrical from base, curved towards apex, 1.3-2 times longer than lower lip.

Utricularia lowriei R.W.Jobson 2013

Small probably annual, terrestrial or affixed subaquatic herb (Fig. 18). The specific epithet honours botanist Allen Lowrie, who has greatly advanced the study of *Drosera*, *Stylidium*, and *Utricularia*. Found in far north Queensland on the Yorke Peninsula, in shallow water at edges of depressions on deep Sand. Endemic to a small area north of Cooktown, and also found c. 650 km further north at Sanamere Lagoon and Jacky Jacky. This species differs from *Utricularia dunstaniae* with presence of three filiform central lower lip lobes that are longer than the spur.

Utricularia magna R.W.Jobson & M.D.Barrett 2018

Medium-sized probably annual, terrestrial herb (Fig. 19). The specific epithet is from the Latin *magnus* (big, great, large) and refers to the unusually large bladder-traps. Known only from the southern edge of Prince Regent Nature Reserve, where it is restricted to sandstone pavements. Similar to *Utricularia tridactyla* P.Taylor, but differs in having a light-mauve corolla, a shallowly 3-lobed corolla lower lip with lobes broadly rounded at the apex, corolla upper-lip superior part obovate, bladder-traps usually to c. 7.2 mm (rarely to 10 mm) long. This species was also previously confused with *U. arnhemica* P.Taylor from the Northern Territory, based mainly on bladder-trap size.

Utricularia oppositiflora R.Br. 1810

Terrestrial or subaquatic annual or perennial herb (Fig. 20). The specific epithet is from the Latin *oppositus* and *flora,* referring to the opposite pedicels and flowers that are often spaced 180 degrees at the same node on the inflorescence. Widely distributed from south-western Western Australia to coastal South Australia, Victoria, and New South Wales. In Western Australia, there are four known sites from Kalbarri, Perth, the Stirling Ranges, and Cape le Grand on the southern coast. In eastern Australia, *Utricularia oppositiflora* occurs from around Nabiac, New South Wales, southward to Wilsons Promontory, Victoria, Tasmania, and south-eastern South Australia. The species inhabits shallow seasonal swamps and depressions, and creek-lines in moist heathland. Bentham (1868) included *U. oppositiflora* collected in 1804 by Robert Brown near Sydney, New South Wales under *U. dichotoma*. This was accepted as a synonym by Taylor (1989). Jobson and Baleeiro (2020) resurrected this species based on molecular evidence. *U. oppositiflora* has been confused in the past with *U. dichotoma*. Although *U. oppositiflora* varies considerably in size (being mostly dependent on water depth), it is largely morphologically consistent, and is always characterised by dark-purple vertical nerves on the upper corolla lip and a broad, dorsi-ventrally compressed corolla spur that is shorter than the lower lip.

Figure 17: *Utricularia limmenensis* flower frontal view; flower lateral view (images by R.W. Jobson, courtesy of The Royal Botanic Gardens & Domain Trust, Sydney).

Figure 18: *Utricularia lowriei* flower frontal view (image R. Nunn); flower lateral view (image G. Bourke).

Figure 19: *Utricularia magna* flower frontal view; flower lateral view (images R. Barrett).

Figure 20: *Utricularia oppositiflora* flower frontal view; flower lateral view (images R. Nunn).

Figure 21: *Utricularia papilliscapa* flower frontal view; flower lateral view (images T. Krueger)

Utricularia papilliscapa R.W.Jobson & M.D.Barrett 2018

Small-sized annual, terrestrial herb (Fig. 21). The specific epithet refers to the densely papillose peduncle base. Known only from a few locations in the Northern Kimberley region of Western Australia. Found on shallowly inundated sandy skeletal substrate over sandstone pavement. Similar to *Utricularia tridactyla* but differs in having lower peduncle densely papillose, a corolla light pink, a more shallowly 3-lobed lower lip with palate a yellow patch at base, corolla upper lip superior part oblong and acutely bifid.

Utricularia speciosa R.Br. 1810

Subaquatic perennial herb (Fig. 22). The specific epithet is from the Latin *speciosus* meaning showy, splendid. Known from only four populations restricted to Wallum swamps and lagoons on the central and mid-northern coast of New South Wales. A subaquatic species often found in the deeper areas of swamps (~50 cm deep) the large size of the multi-veined leaves may allow this species to occupy deep-water habitats. Bentham (1868) included *Utricularia speciosa* collected in 1804 by Robert Brown near Sydney, New South Wales under *U. dichotoma*. This was accepted as a synonym by Taylor (1989). Jobson and Baleeiro (2020) resurrected this species based on molecular evidence. Other than its habitat preferences, *U. speciosa* is distinguished by leaves that are obovate, apex rounded or truncate, 3–6 cm long, veins 2–13 and an upper corolla lip that is bilobed.

Utricularia wannanii R.W.Jobson & Baleeiro 2015

Small sized probably annual, lithophytic herb (Fig. 23). The specific epithet honours Dr Bruce Wannan, botanist and environmental scientist at the Queensland Herbarium (BRI), and collector of *Utricularia wannanii*. Only known from the type location at Garimbu Creek, a tributary of the Roe River catchment, western Kimberley region. Found growing on seepage of shaded south fac-

Figure 22: *Utricularia speciosa* flower frontal view; flower lateral view (images R. Nunn).

Figure 23: *Utricularia wannanii* flower frontal view; flower lateral view (images B. Wannan).

ing sandstone rock-faces (vertical and horizontal) in the lithophytic habit, with nearby drier areas containing a *Stylidium* sp. With its lithophytic habit, small size, and uniquely shaped flowers, *U. wannanii* is unlikely to be confused with any other Australian species of *Utricularia*. Has bracts and bracteoles similar to those of *U. georgei* P.Taylor but differs in having corolla lobes of the upper and lower lip long, subulate, with strongly reduced spur, peduncle up to 15 mm long, seeds ovoid.

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Figure 24: Habitat of *Utricularia albertiana*, Theda Station, WA, Australia. Photo by Richard Nunn.

Figure 25: Habitat of *Utricularia dichotoma* subsp. *novae-angliae*, Arding, NSW, Australia. Photo by Richard Nunn.

Refined taxon sampling discloses new quinone patterns and relationships among Sundews (*Drosera*, Droseraceae)

In Memoriam Allen James Lowrie (1948 - 2021),
without whom we would not even know about many species investigated in this study

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Keywords: *Drosera*, phytochemistry, naphthoquinones, chemotaxonomy.

Abstract: In a screening of 43 accessions of predominantly Australian sundew species (*Drosera*), naphthoquinones were detected convincingly for the first time in *D.* section *Lasiocephala* (*D. petiolaris* group, or 'wooly sundews'), where these metabolites remain restricted to a minority of four closely related species. Great chemical similarity across the large geographic range confirms a close phylogenetic affinity between taxa of the *D. peltata* species group (of *D.* section *Ergaleium*, from tropical and Eastern Asia to New Zealand). *Drosera barrettiorum* (*D.* section *Arachnopus*) is chemically confirmed as a close relative of *D. hartmeyerorum*. The recently described species *D. margaritacea* in the same section is chemically different from the morphologically close *D. finlaysoniana*. Quinone data for African and South American sundews (*D.* sections *Drosera*, *Ptycnostigma* and *Brasilianae*) shed further light on the affinities between these taxonomically challenging plants.

Introduction

The *Drosera petiolaris* R.Br. group (*D.* section *Lasiocephala* Planch.) of tropical Australasia is the last remaining speciose section in the genus *Drosera* L. that has hitherto resisted to yield appreciable amounts of naphthoquinones, although traces of plumbagin (**P**) have been detected in *D. banksii* R.Br. ex DC. (Schlauer *et al.* 2019a). Many closely interrelated taxa have been described recently (Gibson *et al.* 2012; de Salas 2018) in the polymorphic and widespread *D. peltata* Thunb. group (*D.* section *Ergaleium* Planch., from tropical and Eastern Asia to New Zealand), and an attempt is made here to test and compare the chemical profiles of as many of these segregates as possible. *Drosera* section *Arachnopus* Planch. has already been screened for naphthoquinones to some extent but *D. barrettiorum* Lowrie that is supposedly closely related to *D. hartmeyerorum* Schlauer, and *D. margaritacea* Krueger & A.Fleischm. that is morphologically similar to *D. finlaysoniana* Wall. ex Arn., have not been at our disposal for chemical investigation before. Similar comparisons are also due for a number of additional pairs of sister taxa from Australia, Africa, and America, of which cultivated material has now become available.

Materials and methods

All plants used in the present study were cultivated at Andreas Fleischmann's greenhouse in southern Germany. Fresh leaf samples were investigated as reported previously (Schlauer *et al.* 2017).

Results

Naphthoquinones were detected in the investigated samples as summarized (together with previous results) in Table 1.

Table 1. *Drosera* taxa investigated and quinones found.
P: plumbagin, M: ramentaceone, 0: no quinone detected

Section	Taxon	Quinone(s)	Comment
Lasiocephala	*D. brevicornis*	0	new data
Lasiocephala	*D. broomensis*	P	new data
Lasiocephala	*D. caduca*	P	new data
Lasiocephala	*D. darwinensis*	0	new data
Lasiocephala	*D. derbyensis*	P	new data
Lasiocephala	*D. dilatatopetiolaris*	0	new data
Lasiocephala	*D. falconeri* (2 different accessions tested)	0	new data
Lasiocephala	*D. fulva*	M	new data
Lasiocephala	*D. kenneallyi*	P	new data
Lasiocephala	*D. lanata* (Qld.)	0	new data
Lasiocephala	*D. aff. lanata* (NT)	0	new data
Lasiocephala	*D. paradoxa* (Arnhem Escarpment)	0	new data
Lasiocephala	*D. aff. paradoxa* (swamp form)	0	conf. Schlauer *et al*. 2019a
Lasiocephala	*D. aff. paradoxa* (orange form)	0	new data
Lasiocephala	*D. petiolaris* (Qld.)	0	conf. Culham & Gornall 1994?
Lasiocephala	*D. petiolaris* (NT)	0	conf. Culham & Gornall 1994?
Ergaleium	*D. macrantha* (*s.str.*)	P	conf. Culham & Gornall 1994?
Ergaleium	*D. moorei*	P-trace	new data
Ergaleium	*D. gracilis* (Papua New Guinea)	P, M-trace	new data
Ergaleium	*D. gunniana* (Tasmania)	P, M-trace	new data
Ergaleium	*D. hookeri* (Tasmania)	P, M-trace	new data
Ergaleium	*D. lunata* (Thailand)	P + M	new data
Ergaleium	*D. auriculata* (NSW)	P	conf. Culham & Gornall 1994
Ergaleium	*D. zigzagia*	P	new data
Erythrorhiza	*D. aberrans*	P + M	cf. Schlauer *et al*. 2019a (only M)
Stolonifera	*D. stolonifera* (*s.str.*)	0	cf. Culham & Gornall 1994 (P)
Arachnopus	*D. barrettiorum*	M	new data
Arachnopus	*D. margaritacea*	P, M-trace	new data
Drosera	*D. amazonica* (locus classicus)	M	new data
Drosera	*D. aff. amazonica* (Colombia)	P, M-trace	new data
Drosera	*D. biflora* (Colombia)	P	new data
Drosera	*D. biflora* × *D.* ? (*esmeraldae*?)	P + M	new data
Drosera	*D. esmeraldae* (Venezuela)	M	new data

Table 1. Continued

Section	Taxon	Quinone(s)	Comment
Drosera	*D. intermedia* (Gran Sabana, Venezuela)	P	conf. Culham & Gornall 1994
Drosera	*D. brevifolia* (Brazil)	P, M-trace	cf. Trevisan Ferreira *et al.* 2004 (P)
Ptycnostigma	*D. flexicaulis* (Zambia)	P	new data
Ptycnostigma	*D. madagascariensis* (Madagascar)	M	conf. Culham & Gornall 1994
Ptycnostigma	*D. madagascariensis* (Zambia)	M	conf. Culham & Gornall 1994
Ptycnostigma	*D. pilosa* (Zambia)	M	new data
Brasilianae	*D. graminifolia* (*s.str.*)	M	new data
Brasilianae	*D. magnifica*	M	new data
Brasilianae	*D. tentaculata*	M	new data

Discussion

After the detection of trace amounts of **P** in *Drosera banksii* (Schlauer *et al.* 2019a) the (more pronounced) occurrence of the same quinone in four additional species was not entirely unexpected in *D.* section *Lasiocephala*. Together with the fact that most other species of this section lack naphthoquinones, our results indicate a close relationship between *D. broomensis* Lowrie, *D. caduca* Lowrie, and *D. derbyensis* Lowrie. All of these are confined to the Kimberley region of northernmost West Australia and are possibly further linked to *D. kenneallyi* Lowrie, that occurs both in the Kimberley and in the Northern Territory and is morphologically a close relative of *D. falconeri* K.Kondo (endemic to the Darwin region of the Northern Territory, cf. Lowrie 2014), which is apparently devoid of naphthoquinones. The presence of the regio-isomer ramentaceone (**M**) in *D. fulva* Planch. (so far known only from the Northern Territory) indicates an isolated position in the section, possibly together with the morphologically very similar and geographically overlapping *D. brevicornis* Lowrie that lacks naphthoquinones.

P is doubtlessly the main quinone in *D.* sections *Ergaleium* DC. and *Erythrorhiza* Planch. (Culham & Gornall 1994) and this holds true for the close relatives of *D. peltata*, of which most also contain trace amounts of **M**, and *D. lunata* Buch.-Ham. ex DC. (at least in the specimen from Thailand that we investigated) even contains both quinones at comparable concentrations. Our discovery of **P** as an additional quinone in *D. aberrans* (Lowrie & Carlquist) Lowrie & Conran, in which an earlier study (Schlauer *et al.* 2019a) had identified only **M**, consolidates its position (makes it chemically less "aberrant") in *D.* section *Erythrorhiza*. In this study we failed to detect **P** in *D. stolonifera* Endl. (in contrast to Culham & Gornall 1994), but as absence of metabolites does not constitute a reliable feature (especially if there is some deviating evidence), we abstain from drawing taxonomic conclusions from our result.

Once the detection of **M** in *D.* section *Arachnopus* was a surprise (Schlauer *et al.* 2017), and it remains less common there than **P**. It can thus be taken as further proof for the taxonomic significance of quinone patterns that **M** is the characteristic isomer in both *D. barrettiorum* and *D. hartmeyerorum*, that are jointly distinguished from all other relatives by emergences with exceptionally large heads at the leaf bases and that are morphologically similar and geographically overlapping (Lowrie 2014). The recently described species *D. margaritacea* (Krueger & Fleischmann 2021) is the first Australian member of *D.* section *Arachnopus* to produce both quinone isomers (with **M** at trace amounts but clearly detectable), a pattern previously identified in this section only in species outside Australia so far (*D. indica* L. and *D. serpens* s.l. (*D. makinoi* Masam.; Schlauer *et al.* 2019b)). The morphologically similar

D. finlaysoniana is apparently invariably characterized by formation of the **M**-precursor dihydroramentaceone while **P** is the main quinone with **M** remaining below detection (Schlauer *et al.* 2021).

D. sections *Drosera*, *Ptycnostigma* Planch., and *Brasilianae* Rivadavia, Gonella & A.Fleischm. constitute the widespread "crown group" of the genus that includes the vast majority of species outside Australia. **M** is generally the dominant quinone in all three sections. **P** is interestingly found in *D. flexicaulis* Welw. ex Oliv., which confirms its close relationship with *D. affinis* Welw. ex Oliv. (cf. Schlauer *et al.* 2019a). A plant morphologically similar to *D. amazonica* Rivadavia, A.Fleischm. & Vicent. clearly deviates from typical specimens, which may indicate the influence of another taxon (introgression?). A plant (containing both **M** and **P**) is suspected to represent a hybrid involving *D. biflora* Willd. in Roem. & Schult. (that contains **P**). The other parent may be *D. esmeraldae* (Steyerm.) Maguire & Wurdack (that has possibly contributed its quinone, **M**). These examples further demonstrate the utility of quinone patterns, especially in taxa of reticulate evolution, (Schlauer & Fleischmann 2016) where morphological comparison alone often does not yield unambiguous results.

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Cultivating kids: A passion for carnivorous plants

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Father's point of view

Despite being decades ago, I still recall the Venus flytrap my mother purchased for me from the local grocery store when I was maybe eight years old. The youthful euphoria was fleeting, as I managed to kill the plant in a short time. In retrospect, it may have been the ham I fed it, the constant stimulation I did with my fingers to trigger the traps, or maybe the really hard water of my hometown tap. But the excitement was there… and six years ago I saw that same twinkle in my four-year-old son's eyes when we visited the late Richard Wuydts' World's Rare Plants carnivorous plant nursery in Halfmoon Bay, California. But would the outcome be the same? A short-lived one-time purchase? Or something more?

Fast forward 6 years and my now 10-year-old son still has that glimmer in his eyes and the wry smile when he talks about his Venus flytraps with his friends and teachers. The single plant now numbers well over 100 different flytrap cultivars with many unnamed seed grown crosses that he has created over the last several years, and 3 registered cultivars that he's had a hand in naming. Moreover, the "single plant" now occupies some serious real estate in our backyard, putting him at odds with the real head of the house.

We both had a similar thrilling experience with our first plant – one led to a serious passion for my son, but mine kind of fizzled out decades ago. Is it all child related? Are some children just more inclined to develop a passion for such things? Or is there something more to how my son's passion and focus developed. I am neither a developmental psychologist nor educator. I do have a background in science and bonsai trees, but that is the extent of the disclaimer you will read here. I honestly do not know if my approach was the right one, but this is how I approached my son's interest and how it seemingly has stuck.

I have always believed that kids are motivated by interest – not just their interests, but those of their parents as well. When adults show interest, it can be infectious for kids. I think my son's first introduction to carnivorous plants left a strong impression on him at the age of four years old – it was the late Richard Wuydts, owner of the local carnivorous plant nursery, who took him on a Willy Wonka-esque tour of his nursery. Richard spent maybe an hour, walking through his nursery, telling him stories about his plants – where they came from, their history, his travels, and how he was captivated by them as a child. It was like winning a Golden Wonka ticket, and afterward my son had many questions. Truthfully, that first impression was instrumental in sparking his interest. Afterward, I tried to show him I was interested. I found some children's books about carnivorous plants and we read them together.

I feel that it's important to let him explore his interests, but also support that interest. I often hear folks using plants and pets as a way to teach responsibility and while I agree to an extent, the age of the child and expectations need to be considered. There's really no faster buzzkill than to find your prized plants dried and dead. My son is very good at knowing when he needs to water his plants now, but when he was 4-5 years old, I would remind him or water them myself in the evening after work. I think him seeing me involved made it an opportunity for us to spend time together which is a win-win situation.

As he's gotten older and more mature, he's taken the initiative to read some higher-level books (Peter D'Amato's *The Savage Garden*), do some online video searches for more advanced cultivation techniques, and devise some experiments to test some of his ideas. Sometimes that involves reading together or discussing what certain passages mean. Eventually, his Venus flytrap project extended beyond growing plants. He wanted to try to create new plants with new characteristics. It's probably a bit early to teach Mendelian genetics (not sure that Venus flytraps are a good example of simple Men-

delian genetics) but we started with a simple discussion of genetic traits and how trait selection can be done. For the last four years, we have been hand-pollinating Venus flytraps (and isolating flowers) and growing the seeds. As our grow space has been limited, we decided to sell some seeds online. I helped him sell seeds online, and it was an opportunity for additional growth and learning. He was in charge of keeping orders organized, writing letters to the customers, and keeping track of the funds. We have now gone through four years of seed production and this past year; he did all the crosses himself and nearly all of the seed harvest. He has been meticulous about keeping track of the hand pollination. This year, he asked if we could donate our seed funds to others who have been affected by COVID. Seeing this social awareness during a really bizarre year of remote learning was a tremendous proud papa moment. That single carnivorous plant has transformed into a much larger project, but the key has been letting him explore and being there to support his interests and initiatives.

Also intrinsic to the growth of his passion has been his relationship with others in the hobby. The generosity and collaboration of folks like Craig Heath and the late Richard Wuydts have further stoked his love of these plants. I have seen him pass on this generosity to other children as he frequently gives his plants to friends, classmates, and other local hobbyists.

Ultimately, I believe the most important facets of building a passion are: allowing the child to explore, supporting their interest while showing your interest, not forcing unreasonable age-inappropriate responsibility, building fun collaborative relationships with other hobbyists, and eventually giving back to your community in some form. Give this guideline a try… hopefully that grocery store Venus flytrap I killed decades ago did not die in vain.

10-year-old son's point of view

I love Venus flytraps, and believe that they have had a huge impact on my life. There are innumerable interesting aspects. I enjoy Venus flytraps because of my history with them, the process of crossing them, and my latest cultivar, *Dionaea* 'EEC Purple People Eater'.

I have been interested in carnivorous plants for six years, since I was four years old. The first time I saw a carnivorous plant was at our local Junior Museum. After, my parents took my sister and me to a carnivorous plant nursery, World's Rare Plants run by the late Richard Wuydts, where I noticed that there was a myriad of interesting carnivorous plants, and I loved the insect eating part. Richard Wuydts helped me develop a curiosity for these plants. The first carnivorous plant I started growing was a *Sarracenia minor* plant from his store and a Cape sundew that was hiding in the pot. I put my pitcher plant outside in the backyard, and we took care of it by watering at the bottom of the tray. Also, I caught flies for them. Later, I purchased my first Venus flytrap, a *Dionaea* 'Jaws', from Richard, but I did not understand how Venus flytraps capture insects. I read a book called *The Savage Garden* by Peter D'Amato with my father's help. It taught me how to grow Venus flytraps. A couple years later, I learned how to hand pollinate Venus flytraps from the book *Savage Garden* because I wanted to create new plants and see if I could select traits. Traits I tried to select for included trap size, color, growth habit, and cilia shape and size, and petiole length. After four years, I have close to a hundred crosses. Every summer, I collect seeds after hand pollination and record the crosses. I have learned countless concepts on successfully cultivating Venus flytraps.

Crossing Venus flytraps is hard work. First, in the spring, I take an anther from one Venus flytrap flower using tweezers. Then, I touch the anther to a different Venus flytrap flower that has a fuzzy appearing stigma. It is paramount to label the crossed flower, so I can keep track of which crosses have been made. If I have a typical Venus flytrap or I don't want to be organized, labelling can be skipped. If I want to be accurate, it is critical to avoid pollinators, including bees and butterflies, touching

the flower until the pollen has faded because they can contaminate your crosses. After the flower has opened a second time showing glistening, black seeds, they can be harvested using tweezers. Because the seeds tend to shoot out, I put them in a miniature wax bag, so I do not lose them. In fact, my favorite part of the whole process is shooting the seeds out of the flower. After, I put the seeds on a sheet of white paper, and pull the dried flower parts out because they can cause mold when planting them. I plant my seeds in a peat-based soil as early as possible and grow them under lights for the first year. Finally, I plant them about three inches apart, and away from the corners of the pot. Each year, I have been selling my seed crosses online with the help of my father. This year, because COVID negatively impacted so many people, I decided to donate all proceeds from our sales to three charities that help those impacted by COVID. I donated over $700 this year and hope to donate more next year.

Dionaea 'EEC Purple People Eater' is my latest Venus flytrap cultivar. To make this cultivar, *D.* 'FTS Maroon Monster' was crossed with *D.* 'Jaws Smiley'. Out of about 80 seeds, there was one plant that was unique. My hope was to make a red Venus flytrap with curved, elongated traps. After it sprouted, we named the Venus flytrap *D.* 'EEC Purple People Eater' because of personal protective equipment (PPE) during COVID and the song "Purple People Eater." *Dionaea* 'EEC Purple People Eater' is mainly red, but has a bright, lime-yellow line before the cilia. The cilia have a dentate appearance.

As you can see, I love Venus fly traps because I have a history with them, enjoy making new crosses, and creating new cultivars, such as *Dionaea* 'CCCP Sea Scallop' found on page 78 of this issue. My future goal is to make another cultivar, and continually improve my plant care. I believe Venus flytraps will be an integral part of my life forever. I am currently doing some experiments on fertilizer and Venus flytraps and water germination of Venus flytrap seeds.

Evan Wang: A) Age 4, with one of his first Venus flytraps; B) Age 6, preparing cape sundews to give to his classmates; C) Age 10, tending to his Venus flytraps; D) Age 10, showing one of his giant Venus flytraps.

New cultivars

Keywords: cultivar, *Sarracenia* × *moorei* 'Prof. Goetghebeur', *Dionaea* 'CCCP Sea Scallop', *Sarracenia* 'Mocha Dick'.

Abstract: Three new carnivorous plant cultivars are named and described: *Sarracenia* × *moorei* 'Prof. Goetghebeur', *Dionaea* 'CCCP Sea Scallop', *Sarracenia* 'Mocha Dick'.

Sarracenia × *moorei* 'Prof. Goetghebeur'

Submitted: 2 October 2021

Sarracenia × *moorei* 'Prof. Goetghebeur' (Fig. 1) was selected from seedlings of a crossing made by Mike King between *Sarracenia flava* var. *rugelli* (giant robust, MK F18) and *Sarracenia leucophylla* (large pink lipped, Apalachicola National Forest, MK L18). This cultivar exhibits green pitchers at its base and dark red-purple veining below the mouth, which intensifies at the nectar collar and lid. *Sarracenia leucophylla* characteristics are clearly visible as white spots on the lid.

The seedling was purchased from Rogier Van Loenen by Wim Van den Broeck in 2015. The latter also named the cultivar in 2019. *Sarracenia* × *moorei* 'Prof. Goetghebeur' is named in honor of professor Paul Goetghebeur, a retired botanist from Ghent University (Belgium) who was also director of the botanical garden of Ghent.

Sarracenia × *moorei* 'Prof. Goetghebeur' must only be propagated vegetatively to preserve its unique characteristics.

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Figure 1: *Sarracenia* × *moorei* 'Prof. Goetghebeur'.

Dionaea 'CCCP Sea Scallop'

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Dionaea 'CCCP Sea Scallop (Fig. 2) is a cross by Evan Wang and Craig Heath. The pollination was performed in 2018 by Evan Wang with isolation of flowers after pollination. The seed was the product of (*Dionaea* 'Fused Tooth' × an unregistered, heavily fused cilia plant, originally crossed by Jen Lei) × *Dionaea* 'DC XL'. Many seeds were grown by Evan Wang and Craig Heath. One, grown in Lorton, Virginia, developed the unique phenotype of *Dionaea* 'CCCP Sea Scallop'.

Dionaea 'CCCP Sea Scallop' is characterized by fused cilia, and a rather short trap. Cilia fusion can vary from mild fusion of a couple cilia to severe fusion of numerous cilia. Of note, while *D.* 'Fused Tooth' generally exhibits fused cilia on a seasonal basis, *D.* 'CCCP Sea Scallop' maintains fused cilia year-round. The inside of the trap is dark red while the outside is green. The trap has a bright green perimeter next to the cilia. We have seen more prominent red coloration in *D.* 'CCCP Sea Scallop' compared to its parents. All the traps can close, and the majority of the traps can seal and digest prey. *Dionaea* 'CCCP Sea Scallop' has a compact, rosette-style growth pattern with short petioles. Traps measure up to 1.6 cm in length and 1 cm wide and have three interior trigger hairs per trap, per side. Petioles can reach 1.3 cm in length.

The name 'Sea Scallop' is a reference to the marine bivalve family. The fusion of the base of several cilia leads to a bulging, concave trap which resembles a scallop. 'CCCP' is an acronym for Crazy Craig's Carnivorous Plants where seedling selection and propagation of this cultivar were performed.

Dionaea 'CCCP Sea Scallop' must only be propagated vegetatively by rhizome or leaf /floral cuttings to preserve its unique characteristics. It was grown originally in Palo Alto, California, and Lorton, Virginia, USA.

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Figure 2: *Dionaea* 'CCCP Sea Scallop'.

Sarracenia 'Mocha Dick'

Submitted: 4 December 2021

Sarracenia 'Mocha Dick' was grown in April 2015 from seed from *Sarracenia* 'Scarlet Belle' × *Sarracenia* leucophylla (from Mobile Co., Alabama). Pitchers of *Sarracenia* 'Mocha Dick' are relatively small during spring and summer and look their best in autumn (as do most of the *S. leucophylla* hybrids) when they start to become bigger and fatter (up to 50 cm tall) and develop a very large and wide lid (Fig. 3). Pitcher color resembles a pure classic *S. leucophylla* clone with pink lips. The most notable characteristic of this cultivar is the pitcher shape that starts very thin at the base and becomes very large at the top, suggesting the shape of a whale. When the pitcher finally opens it develops a very particular large lid that stands almost vertically on the mouth base. Sometimes, when the pitcher is very big, the lateral sides of the lid roll up on themselves having the appearance of two ears. This cultivar grows very fast and creates some large and nice clumps of growth points. Flowers are totally red and quite small.

Sarracenia 'Mocha Dick' was named in September 2020 after a male albino sperm whale that lived in the Pacific Ocean in the early 19th century and that partially inspired Herman Melville's 1851 novel Moby Dick.

Sarracenia 'Mocha Dick' must only be propagated vegetatively to preserve its unique characteristics.

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Figure 3: *Sarracenia* 'Mocha Dick'.